FIELD CROP ABSTRACTS

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FIELD CROP ABSTRACTS

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FIELD CROP ABSTRACTS

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HERBAGE ABSTRACTS

The subscription rate for *Herbage Abstracts* is the same as for *Field Crop Abstracts*. *Herbage Abstracts*, issued quarterly, presents, in condensed form, the world's current scientific literature on grasslands, fodder crops, and their management. A specimen copy will be sent on request.

The chief aim of this Bureau is to abstract all published results of current scientific research on annual field crops, herbage and fodders, and to make these abstracts available through our two quarterly journals, *Field Crop Abstracts* and *Herbage Abstracts*. To achieve this aim, the Bureau staff maintains a constant scrutiny of approximately 1000 periodicals, reports and occasional publications which reach us from more than 75 countries. A list of these periodicals and reports examined appeared in *Field Crop Abstracts* Vol. 13, No. 2. The Bureau is always seeking to expand its coverage, and suggestions for suitable additions to these lists will be appreciated. All scientific publications relating to annual field crops, herbage and fodder crops, particularly special reports and advance copies of papers, are required so that they may be abstracted and their contents made known to our readers with the minimum delay. *Field Crop Abstracts*, now in its 14th year, has a world-wide circulation.

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Suggestions for review articles, or comments on those published in the journals, are invited.

The Director is always pleased to receive comments on *Field Crop Abstracts* and suggestions for its improvement.

The abstracts herein are concerned only with those aspects of agricultural science covered by *Field Crop Abstracts* (see table of contents). For other aspects, e.g. plant breeding, soil science, plant pests and diseases (other than control), reference should be made to the C.A.B. journals covering those subjects. For abstracts dealing with plantation crops, including sisal, sugar-cane and tobacco, see *Horticultural Abstracts*.

Where † follows the number which appears before a heading, it indicates that the abstract, book review or title only, is also reproduced in *Herbage Abstracts*.

The locality shown in square brackets at the end of the heading of an abstract indicates where the work was carried out.

' F.s. ' at the end of an abstract indicates ' From summary '.

Eng., Span., Ger., etc. denote language used in summary.

Ext. = Extract

A list of periodicals examined together with their abbreviated titles can be seen in *Field Crop Abstracts*, Vol. 13, No. 2.

CORRIGENDA

Vol. 14, No. 1, Abs. 356, line 7, for VNIIMK 646, read VNIIMK 1646.
Vol. 14, No. 3, Abs. 1513, line 2, for *Pl. Path.* 1961, **10**, read *J. Inst. corn agric. Merch.* 1961, **9**.

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REVIEW ARTICLES

The following is a list of review articles which have appeared in *Field Crop Abstracts* Vols 8, 9, 10, 11, 12 and 13.

BOYLE, P. J. and BAULKWILL, W. J. Potatoes : the use of cut setts and the treatment of cut surfaces. 1955, **8**, No. 1, 1–10.

MASEFIELD, G. B. Legislation on the burning of vegetation in the British Colonies. 1955, 8, No. 2, 71–5.

THORNE, Gillian. Nutrient uptake from leaf sprays by crops. 1955, **8**, No. 3, 147–52.

COOKE, G. W. and WIDDOWSON, F. V. Fertilizer placement for arable and herbage crops. 1955, **8**, No. 4, 233–7.

WOODFORD, E. K. and KASASIAN, L. The control of weeds in cereal crops in Europe by chemical methods. 1956, **9**, No. 1, 1–8.

SOPER, M. H. R. Field beans in Great Britain. 1956, **9**, No. 2, 65–70.

HOLLIDAY, R. Fodder production from winter-sown cereals and its effect upon grain yield. Parts 1 and 2. 1956, **9**, No. 3, 129–35 and No. 4, 207–13.

DADD, C. V. Wild oats. 1957, **10**, No. 1, 1–10.

POHJAKALLIO, O. Light climate and crop growth in Finland. 1957, **10**, No. 2, 77–82.

DOGGETT, H. Bird-resistance in sorghum and the Quelea problem. 1957, **10**, No. 3, 153–6.

ORLOVSKIĬ, N. I. Monogerm sugar-beet. [Translation from Russian] 1957, **10**, No. 4, 221–4.

ORAM, P. A. Recent developments in groundnut production, with special reference to Africa. Parts 1 and 2. 1958, **11**, No. 1, 1–6 and No. 2, 75–84.

HARVEY, P. N. Sowing and thinning the sugar-beet crop. 1958, **11**, No. 3, 151–60.

CHARLES, A. H. The effect of undersowing on the cereal cover crop. 1958, **11**, No. 4, 233–9.

MILTHORPE, F. L. Transpiration from crop plants. 1959, **12**, No. 1, 1–9.

BEST, R. Photoperiodism in rice. 1959, **12**, No. 2, 85–93.

TORSSELL, B., ÅBERG, E. and ÅKERBERG, E. The possibility of cultivating maize in regions with low temperatures. 1959, **12**, No. 3, 169–75.

FREDERIKSEN, P. S. A review of recent research on the agronomy of fibre flax. 1959, **12**, No. 4, 259–65.

LÖÖF, B. The agronomy and present position of oil-seed crops in Scandinavia — a review of the literature. 1960, **13**, No. 1, 1–7.

MCGREGOR, W. G. Research on oil-seed flax in North America. 1960, **13**, No. 2, 83–7.

HOLLIDAY, R. Plant population and crop yield. Parts 1 and 2. 1960, **13**, No. 3, 159–67 and No. 4, 247–54.

BLACK, J. N. and WATSON, D. J. Photosynthesis and the theory of obtaining high crop yields, by A. A. Ničiporovič. An abstract with commentary. 1960, **13**, No. 3, 169–75.

Tomato [tŏmā·to (Eng), tŏmēi·to (US)]: from Sp. *tomate* adapted from Mexican *tomatl*. *Lycopersicum esculentum* (family *Solanaceae*). 1. A native of S. America, introduced to Europe in early 16th c. and to USA in early 19th c. 2. Botanically a fruit but popularly considered as a vegetable. Excellent source of vit. A & C. 3. Often affected by nematode infestation causing stunted, wilted plants, inferior yields and loss of profits. 4. Crop should be protected from such damage by thorough treatment of the soil with D-D before planting. 5. Against this and other pests, Shell pesticides *(cf.* aldrin, dieldrin, endrin, Phosdrin and Nemagon) offer sure protection.

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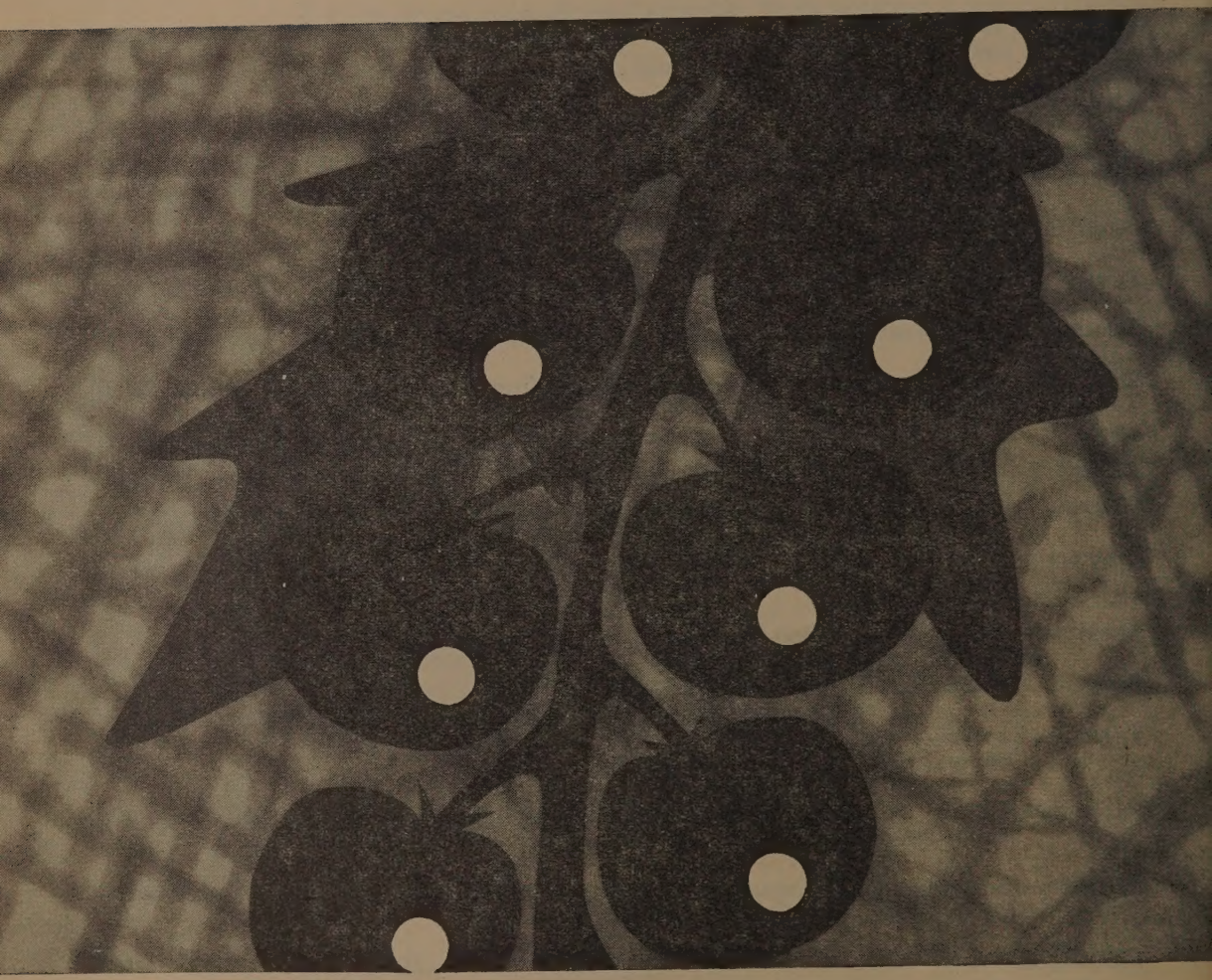

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FIELD CROP ABSTRACTS

Vol. 14 February, 1961 No. 1

CURRENT AGRICULTURAL RESEARCH IN AFRICA ON ANNUAL FIELD CROPS AND GRASSLANDS

In each of the numbers of this volume of *Field Crop Abstracts*, brief details (obtained from replies to questionnaires) will be published of those agricultural research institutes and experiment stations in Africa which are concerned with annual field crops, grasslands and fodder crops. Countries are arranged in alphabetical order. For each station, under the heading *Principal lines of research*, the numbers (1), (2), (3), (4) and (5) refer to : (1) Annual field- or fodder-crops (including cassava), (2) Grass or grass/legume mixtures, (3) Natural grasslands, (4) Farming systems, and (5) Other lines of research concerned with grasslands, fodders or annual field crops (except tobacco).

ANGOLA

Chianga, Plant Improvement Station

Location : Chianga, New Lisbon, District of Huambo. Lat. 12° 40′ S. Long 15° 50′ E. Alt. 1705 m (5594 ft).
Met. data : Rainfall 1272 mm (50 in.) (duration of dry season 18 weeks). Max. shade temp. 33·0°C (91·4°F). Min. shade temp. 2·0°C (35·6°F).
Size of station : 2280 hectares (5634 acres).
Number of graduate research workers on staff : 3.
Principal lines of research :

(1) Wheat : improvement for resistance to *Puccinia graminis* and *P. tritici*. Oats : for fodder. Barley : improvement for malting. Maize : improvement of local varieties, studies of introduced varieties, hybrids. Soyabeans : study of varietal adaptation. Flax : study of the adaptation of oil-seed varieties.

(2) Studies on the adaptation of varieties.

(4) Studies on crops, rotations.

Cunene, Agricultural Centre

Location : Namuculungo, District of Huila. Lat. 17° 01′ S. Long. 14° 45′ E. Alt. 1100 m (3609 ft).
Met. data : Rainfall 526 mm (21 in.) (duration of dry season 24 weeks). Max. shade temp. 38·7°C (101°F). Min. shade temp. 2·6°C (36°F).
Size of station : 100 hectares (247 acres).
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Wheat, oats, rye, barley, maize, sorghums, rice, soyabeans, groundnuts, cotton, flax and sesame : varietal behaviour, sowing dates and sowing methods.

Humpata, Agricultural Centre

Location : Humpata, District of Huila. Lat. 14° 58′ S. Long. 13° 22′ E. Alt. 1860 m (6102 ft).
Met. data : Rainfall 810 mm (32 in.) (duration of dry season 22 weeks). Max. shade temp. 30·5°C (87°F). Min. shade temp. 1·4°C (34°F).
Size of station : 850 hectares (2100 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Wheat, maize : comparative study of varieties, seed rates and manuring. Soyabeans, potatoes, flax : comparative study of varieties, sowing date, seed rate and manuring.

(2) *Desmodium abyssinicum, Eragrostis curvula*, ronpha grass, *Melinis minutiflora, Chloris gayana* and *Dactyloctenium aegyptiacum.*

(5) Lucerne : behaviour, adaptation and yield.

Humpata, Animal Husbandry Station of the South

Location : Humpata, District of Huila. Lat. 14° 55′ S. Long. 13°18′ E. Alt. 2100 m (6890 ft).
Met. data : Rainfall 765 mm (30 in.) (duration of dry season 22 weeks).
Size of station : 8700 hectares (21,498 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Wheat, oats, rye, barley, maize, sorghums, vetch, serradella, potatoes.

(2) Ronpha grass, *Eragrostis curvula*, lucerne, elephant grass, oats and vetch. The aim is to establish permanent sown pastures (mixtures of grasses and legumes) under irrigation.

(3) Rough grazings : *Hyparrhenia* sp., *Heteropogon* sp., *Eragrostis* sp., *Themeda triandra, Setaria* sp., *Rhynchelytrum* sp., *Urochloa* sp. Improvement of natural grasslands.

(4) Cattle kept in sheds part of the time : during the dry season they receive a supplementary feed of hay and silage. Lucerne is fed the whole year round. Sheep : grazed during the day and kept under shelter at night.

(5) In the field of animal nutrition, foreign forage plants are tested.

Malange, Agricultural Centre

Location : Malange, District of Malange. Lat. 9° 23′ S. Long. 16° 26′ E. Alt. 1200 m (3937 ft).
Met. data : Rainfall 1273 mm (50 in.) (duration of dry season 18 weeks). Max. shade temp. 34·0°C (93·2°F). Min. shade temp. 4·0°C (39·2°F).
Size of station : 800 hectares (1977 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Wheat, maize, rice, soyabeans and groundnuts : varietal behaviour and manurial trials. Beans, cassava : varietal behaviour.

Mariano Machado, Central Station of Animal Husbandry

Location : Mariano Machado, District of Benguela. Lat. 13°14′ S. Long. 14° 35′ E. Alt. 1400 m (4593 ft).
Met. data : Rainfall 1313 mm (52 in.) (duration of dry season 20 weeks). Max. shade temp. 33·1°C (91°F). Min. shade temp. 6·5°C (43°F).
Size of station : 13,000 hectares (32,123 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Oats, maize, sorghums, *Eleusine coracana*, cowpeas, soyabeans, *Dolichos lablab, Cajanus indicus, Stizolobium*, lucerne.

(2) *Eragrostis curvula, Lolium perenne, Melinis minutiflora, Pennisetum clandestinum, P. purpureum, Rhodes grass*, teff grass. Oats in mixture with soyabeans or cowpeas ; lucerne/*Eragrostis curvula* ; maize/*Stizolobium*, soyabeans or cowpeas ; *Pennisetum purpureum/Stizolobium.*

(3) Mainly native species of the following : *Andropogon, Buchnera, Cyperus, Eragrostis, Heteropogon, Hyparrhenia, Indigofera, Melinis, Panicum, Themeda, Tristachya, Sporobolus* and *Urochloa.*

(4) Grazing, cutting green, hay and silage.

(5) Management of grazing. Adaptation of foreign forage plants.

Salazar, Agricultural Station

Location : Salazar, District of North Quanza. Lat. 9°19′ S. Long. 14° 57′ E. Alt. 690 m (2264 ft).
Met. data : Rainfall 1209 mm (48 in.) (duration of dry season 18 weeks). Max. shade temp. 34·4°C (94°F). Min. shade temp. 7·5°C (45°F).

Size of station : 1000 hectares (2471 acres).
Number of graduate research workers on staff : 3.
Principal lines of research :
(1) Legumes : *Canavalia, Centrosema, Calopogonium, Crotalaria, Stizolobium.* Fibre crops : kenaf, *Urena lobata, Abroma augusta* : comparative study and behaviour.

BASUTOLAND

Maseru, Experiment Station

Location : Maseru. Lat. 29° 18′ S. Long. 27° 28′ E. Alt. 5100 ft.
Met. data : Rainfall 27·95 in. (duration of dry season 16–18 weeks). Max. shade temp. 90·5°F. Min. shade temp. 20·3°F.
Size of station : 660 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Wheat, maize, beans : fertilizer trials. Wheat, maize, peas, beans : minor-element trials. Wheat, maize, sorghum, peas, beans, sunflower : variety trials.
(2) Effect of fertilizers on grass leys.
(4) Crop rotations. Agro-economic investigations.
(5) Observations on new types of crops.

BECHUANALAND

Gaberones, Experiment Station

Location : Gaberones. Lat. 25° S. Long. 26° E. Alt. 3200 ft.
Met. data : Rainfall 21 in. (duration of dry season 20–26 weeks). Max. shade temp. 103°F. Min. shade temp. 28°F.
Size of station : New station now being opened, not yet under crops.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize, sorghum, *Pennisetum* millet, cowpeas, groundnuts, beans and *Voandzeia* : selection of suitable varieties for local conditions, sowing-date and spacing trials.

Mahalapye, Experiment Station

Location : Mahalapye. Lat. 23° S. Long. 27° E. Alt. 3000 ft.
Met. data : Rainfall 18 in. (duration of dry season 22–26 weeks). Max. shade temp. 104°F. Min. shade temp. 32°F.
Size of station : 35 acres (under experiments).
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize, sorghum, *Pennisetum* millet, cowpeas, groundnuts, beans, *Voandzeia*, cotton : selection of suitable varieties for local cultivation ; sowing-date and spacing trials.
(3) Work on natural grasslands is carried out on the pasture station at Morale, near Mahalapye. Grazing systems for local conditions.
(4) Rotation and grass ley trials.

CAPE VERDE ISLANDS

S. Jorge, Agricultural Experiment Station

Location : Centre of Santiago Island, N.E. of Peak Antonia. Lat. 15° 03′ N. Long. 23° 36′ W. Alt. 290–900 m (951–2953 ft).
Met. data : Rainfall 729·70 mm (28·7 in.) (duration of dry season *c.* 30 weeks). Max. shade temp. 32·5°C (90·5°F). Min. shade temp. 11·2°C (52°F).
Size of station : 526 hectares (1300 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :
(1) Maize, groundnuts, beans, sweet-potatoes, cassava.
(2) *Brachiaria deflexa, Trifolium* sp.
(3) Almost exclusively grasses among which *Brachiaria deflexa* is dominant ; a few legumes among which *Desmodium abyssinicum* and *Medicago sativa* are dominant.
(5) The work consists mainly in developing and intensifying the above crops, introducing new crops and supplying selected seeds and nursery plants to farmers.

GAMBIA

Gambia, Rice Farm

Location : Sapu, 180 miles inland on River Gambia. Lat. 13° N. Long. 15° W. Alt. 50 ft.
Met. data : Rainfall 46·54 in. (duration of dry season 32 weeks). Max. shade temp. 108°F. Min. shade temp. 50°F.
Size of station : 4000 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Swamp rice : cultivation, varietal and fertilizer trials. Pests, diseases and weed control. Maize, sorghum, millet, soyabeans, groundnuts, cotton, sesame : to find suitable dry season crops.

Jenoi, Rice Experimental Station

Location : Nr Mansakonko. Lat. 13° 30′ N. Long. 15° 30′ W. Alt. 10 ft.
Met. data : Rainfall 40 in. (duration of dry season 32 weeks).
Size of station : 60 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Rice : improvement of agronomic techniques, selection, weeding, use of fertilizers. Groundnuts : mainly fertilizer trials.

Yoroberikunda, Agricultural Station

Location : 3 miles S.E. of Georgetown, 210 miles from Bathurst. Lat. 13° 29′ N. Long. 14° 46′ W. Alt. 71 ft.
Met. data : Rainfall 42 in. (duration of dry season *c.* 29 weeks). Max. shade temp. 109°F. Min. shade temp. 52°F.
Size of station : 100 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Sorghum : fertilizer experiments. Groundnuts : varietal and manurial trials.

Yundum, Experimental Farm

Location : Yundum, Nr Bathurst. Lat 13° 30′ N. Long. 16° 45′ W. Alt. 50 ft.
Met. data : Rainfall 52·63 in. (duration of dry season 30 weeks). Max. shade temp. 105°F. Min. shade temp. 50° F.
Size of station : 940 acres.
Number of graduate research workers on staff : 3.
Principal lines of research :
(1) Groundnuts : varietal and fertilizer trials.
(4) Rotations and soil fertility.

GHANA

Aiyinasi, Agricultural Station

Location : Nzima, Western Region. Lat. 5° N. Long. 2° 30′ W. Alt. 100–150 ft.
Met. data : Rainfall 95·07 in. (no real dry season). Max. shade temp. 91°F. Min. shade temp. 57°F.
Size of station : 866 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize and cassava : varietal trials. Fallow trials: 1–5 years fallow with 2 years of annual crops. Fertilizer trials on annual crops.
(2) The grazing capacities of different types of grasses.

Asuansi, Agricultural Station

Location : Asuansi, 18 miles from Cape Coast. Lat. 5° 18′ N. Long. 1° 14′ W. Alt. 250–350 ft.

Met. data : Rainfall 49·6 in. (duration of dry season *c.* 30 weeks). Max. shade temp. 95·0°F. Min. shade temp. 60·0°F.
Size of station : 540 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize : varietal trials and seed production of approved varieties.
(2) Mixture of grass, *Cynodon plectostachyus*, and legume, *Centrosema pubescens*, in fenced paddocks for the rotational grazing of selected lambs.
(4) Mechanized farming. General mixed farming.

Babile, Agricultural Station
Location : 10 miles south of Lawra. Lat. 10° 30′ N. Long. 2° 45′ W. Alt. 970–1035 ft.
Met. data : Rainfall 43 in. (duration of dry season 20 weeks). Max. shade temp. 105°F. Min. shade temp. 58°F.
Size of station : 538 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize, guinea corn, bulrush millet, finger millet, rice, cowpeas, soyabeans, groundnuts, pigeon peas, sweet-potatoes, cassava, yams.
(2) Pastures mainly *Andropogon gayanus* but little improved and little experimental work undertaken so far.
(3) Guinea savanna. Little experimental work undertaken so far. Grass-burning trial in existence since 1949.
(4) Rotation used is : groundnuts (with 1 cwt superphosphate/ac)/guinea corn interplanted maize (4–6 tons dry.m./ac)/late millet.

Damongo, Agricultural Station
Location : Damongo. Lat. 9° 05′ N. Long. 1° 50′ W. Alt. 625 ft.
Met. data : Rainfall 41 in. (duration of dry season 22 weeks). Max. shade temp. 103°F. Min. shade temp. 64°F.
Size of station : 632 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize, guinea corn (local), late millet, rice, groundnuts and yams : varietal, seed-dressing and fertilizer trials.
(2) *Andropogon gayanus*.
(4) Six-year rotation viz. yams interplanted with late millet/maize interplanted with guinea corn/groundnuts/Dagarti or sanzi beans followed by late millet/pigeon pea/pigeon pea.

Ejura, Agricultural Station
Location : N. Ashanti. Lat. 7° 24′ N. Long. 1° 21′ W. Alt. 700 ft.
Met. data : Rainfall 57·62 in. (duration of dry season *c.* 12 weeks, minor dry season *c.* 8 weeks). Max. shade temp. 98°F. Min. shade temp. 60°F.
Size of station : 1374 acres.
Number of graduate research workers on staff : 2.
Principal lines of research :
(1) Maize, groundnuts, yams, *Urena lobata* for fibre : optimum methods of cultivation, yield trials, processing and storage.
(2) Establishment, utilization and carrying capacity, using sheep, of giant star grass (*Cynodon plectostachyus*) pasture.
(4) Research into the feasibility of fixed system of farming, using rotations involving a period of fallow under pigeon peas instead of the traditional shifting cultivation.
(5) Maize, rice, groundnuts, and yams : research into mechanized production.

Kpeve, Agricultural Station
Location : Volta region. Lat. 6° 41′ N. Long. 0° 20′ E. Alt. 500 ft.
Met. data : Rainfall 49·61 in. (duration of dry season 24 weeks). Max. shade temp. 97°F. Min. shade temp. 55°F.
Size of station : 375 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :
(1) Maize : variety and spacing trials ; stem-borer control with DDT. Legumes : growth and yield and suitability for grazing.
(2) Grass species : growth and suitability for local conditions ; palatability tests. *Cynodon plectostachyus* has proved itself at Kpeve being quick growing, palatable and a good weed suppressor. It has therefore been established on a field scale and fertility will be maintained by the application of inorganic fertilizers. Grassland management: rotational grazing combined with carrying capacity and recovery of sward ; weed control, use of mower and spraying with agroxone.
(3) Effect of fertilizer on natural grassland.
(4) Rotations : the object is to determine the most suitable rotation for a mixed farming system, using grasses in one and legumes with grasses in the other. 3 years food and/or cash crops and 5 years leys. Native farm : the aim is to find the comparative yields of food and/or cash crops using native farming methods.

Kpong, Agricultural Irrigation Research Station, (Univ. Coll. of Ghana)
Location : Nr Akuse, 56 miles N.E. of Accra on Volta River. Lat. 6° 08′ N. Long 0° 04′ E. Alt 40–90 ft.
Met. data : Rainfall 45 in. (duration of dry season 14 weeks). Max. shade temp. 99°F. Min. shade temp. 60°F.
Size of station : 940 acres.
Number of graduate research workers on staff : 2.
Principal lines of research :
(1) Rice : full agronomic investigation with special reference to soil management, control of drainage and irrigation problems.
(2) Range management. Experiments on the improvement of natural grassland : fire control, grazing control, fertilizer use, effect of cutting.
(4) Irrigation farming, furrow and basin irrigation of annual and perennial crops. Introduction of livestock, range farming.

Kwadaso, Central Agricultural Station
Location : Nr Kumasi, Ashanti. Lat. 6° 41′ N. Long. 1° 41′ W. Alt. 710–885 ft.
Met. data : Rainfall 60 in. (duration of dry seasons 12 weeks and 4 weeks). Max. shade temp. 97°F. Min. shade temp. 55°F.
Size of station : 1429 acres.
Number of graduate research workers on staff : 5.
Principal lines of research :
(1) Maize, groundnuts, cassava : varietal, planting date, spacing, fertilizer and harvesting trials. Maize: testing and breeding for rust resistance in collaboration with the West African Maize Rust Research Unit ; breeding programme to develop disease-resistant varieties including hybrid maize. Rice : testing and breeding of varieties suitable for the mechanized rice extension scheme in N. Ashanti. Cassava : testing and breeding.
(4) The effect of continuous cropping with and without inorganic manures ; the benefits from fallowing ; finding the most effective and economic combination of fallow and fertilizer ; to study the effect of the following fallow crops grown for 2 or for 3 years ; *Tephrosia vogelli*, pigeon peas, *Crotalaria juncea*, Guinea grass, elephant grass, giant star grass, and to compare the results with continuous cropping. Six test crops to be taken (2 per year) to assess the fallows.
Effect of long-term tractor cultivations of different intensities on soil fertility ; mechanical handling of fallow

crops, and soil conservation measures necessary in mechanized farming.

An area of 127 acres under 3 rotations as follows :

1 – 76 acres	1st season	2nd season
1st year	Maize	Groundnuts &/or maize
2nd year	Maize &/or groundnuts	Cassava+
3rd year	Cassava+	Cassava+
4th & 5th year	Fallow	Fallow

The fallow crops in use are elephant grass, *Pueraria*, and *Calopogonium*.

II — 36 acres	1st season	2nd season
1st year	Maize	Groundnuts &/or maize
2nd year	Cassava+	Cassava+
3rd year	Cassava+	Fallow
4th year	Fallow	Fallow

The fallow crops are elephant grass and pigeon peas.

+Cassava is in the ground for 12–15 months.

III – 15 acres : Nine years cropping (the first 3 years of rotation I above repeated 3 times) followed by 6 years fallow (elephant grass).

(5) The major- and minor-element deficiencies of soils ; herbicide assessment.

Mampong, Agricultural Station

Location : 36 miles N. of Kumasi. Lat. 7° 03′ N. Long. 1° 23′ W. Alt. 1300 ft.

Met. data: Rainfall 68·5 in. (duration of dry season 10 weeks).

Size of station : 441 acres.

Number of graduate research workers on staff : 1.

Principal lines of research :

(1) Maize : varietal, stem-borer control and fertilizer trials. Groundnuts : varietal, rosette resistance and fertilizer trials. Potatoes : varietal trials.

(2) Observations on the management of giant star grass and its possible mixture with suitable legumes.

(4) Comparison of two systems using elephant grass and pigeon pea fallows on each : (a) three years' crop, 2 years' fallow, (b) two years' crop, 3 years' fallow.

Manga, Agricultural Station

Location : 3 miles S.W. of Bawku. Lat. 11° 01′ N. Long. 0° 16′ W. Alt. 740–840 ft.

Met. data : Rainfall 41·74 in. (duration of dry season *c.* 22 weeks). Max. shade temp. 101°F. Min. shade temp. 66°F.

Size of station : 223 acres.

Number of graduate research workers on staff : 1.

Principal lines of research :

(1) Guinea corn, early and late millet, groundnuts : cost and method of cultivation, varietal, seed-dressing and fertilizer trials.

(2) Sown pastures of *Andropogon gayanus* ; establishment and manurial trials.

(4) 3-course rotation : early millet and guinea corn/early millet and late millet/groundnuts.

(5) Observational work on stem-borers. Herbicide trials.

Nungua, Agricultural Research Station (Univ. Coll. of Ghana)

Location : 17 miles N.E. of Accra. Lat. 5° 30′ N. Long. 0°. Alt. 100 ft.

Met. data : Rainfall 25–35 in. (duration of dry seasons 10 weeks and 15 weeks). Max. shade temp. 94°F. Min. shade temp. 65°F.

Size of station : 1700 acres.

Number of graduate research workers on staff : Work is conducted here by members of the Faculty of Agriculture.

Principal lines of research :

(1) Maize : varietal trials in collaboration with the West African Maize Research Unit, fertilizer trials. Swamp rice : varietal trials. Stem fibre crops : study of seasonal influences on the time of flowering.

(2) Observations on selected native species.

(3) Methods of botanical analysis. Plant succession studies on protected plots. The effects of different grazing intensities and various frequencies of burning.

(4) Investigations aimed at achieving an improved technique of soil and water conservation and drainage at the farm level, using small standard agricultural machinery and mechanized arable crop husbandry.

(5) Maize and velvet beans, millet and velvet beans, and maize and sunflower for ensilage.

Nyankpala, Central Agricultural Station

Location : 12 miles W. of Tamale. Lat. 9° 25′ N. Long. 0° 58′ W. Alt. 620 ft.

Met. data : Rainfall 41 in. (duration of dry season 26 weeks). Max. shade temp. 105°F. Min. shade temp. 60°F.

Size of station : 2478 acres.

Number of graduate research workers on staff : 3.

Principal lines of research :

(1) Maize, guinea corn, early millet, late millet, rice, groundnuts : plant-breeding. Rice and groundnuts : spacing trials.

(4) Comparing two 4-course rotations, one with kraal manure only and one with chemical fertilizers only, with 4-course rotation with kraal manure and chemical fertilizer and with local 3-course rotation followed by 5 years' bush fallow.

(5) Trials to assess profitability of the use of fertilizers in local farming system.

Ohawu, Agricultural Station

Location : Nr Abor, Volta Region. Lat. 6° 07′ N. Long. 0° 54′ E. Alt. 10–95 ft.

Met. data : Rainfall 40 in. (duration of dry seasons 11–12 weeks and 5–6 weeks).

Size of station : 905 acres.

Number of graduate research workers on staff : Nil.

Principal lines of research :

(1) Maize, rice, cowpeas, groundnuts, cassava and fodder crops.

(2) Grazing trials with 8·5-acre blocks of grasses and legumes. Carrying capacity of *Centrosema* pastures for sheep. Heavy fertilizer applications (6 cwt per acre) on natural grassland to investigate response from useful grasses.

(4) 8-course rotation (4 years' fallow/4 years' cropping). 4-course rotation (2 years' legume ley/2 years' cropping). Investigation of methods of fitting livestock into a suitable crop rotation system, f.y.m. to be used to maintain soil fertility. Mechanized and bullock farming to be investigated.

Pokoase, Agricultural Station

Location : 13 miles from Accra on Nsawam road. Lat. 5° 40′ N. Long. 0° 16′ W. Alt. 134–209 ft.

Met. data : Rainfall 40·29 in. (duration of dry season 20 weeks). Max. shade temp. 101°F. Min. shade temp. 60°F.

Size of station : 533 acres.

Number of graduate research workers on staff : 3.

Principal lines of research :

(1) Maize, groundnuts, cassava.

(2) *Andropogon gayanus* : selection. *Andropogon gayanus*/*Centrosema pubescens*/*Stylosanthes*, giant star grass (*Cynodon plectostachyus*)/*Centrosema*, *Panicum maximum*/*Centrosema*, Pangola grass (*Digitaria decumbens*)/*Centrosema*.

(3) Ecological succession. Effect of fertilizers. Effects of late, early or no burning. Management.

(4) Long-term rotational trial to compare and contrast 2 rotations : 2 years' cropping/3 years' fallow, 3 years' cropping/3 years' fallow. Management treatments involving fertilizers, f.y.m., grazing fallows and cutting grass for hay, have been superimposed on the rotational trial. Introduction of a ley into a rotation — 3-years' ley/3-years' cropping. Trials to compare various lengths of Guinea grass fallows. Long-term fertility trial comparing mechanical and hand cultivation. Trash farming trial in conjunction with the Univ. Coll. Ghana. Fertilizer trial to

study the response of crops to application of fertilizers and f.y.m. under conditions of continuous cropping and mechanical cultivations. Mechanized farming methods.

(5) Irrigated pastures. Silage and other methods of conservation. Mechanical processing of cassava. Mechanized planting of grass roots.

Princes, Coconut Station

Location : Ahanta, Western Region. Lat. 4° 30′ N. Long. 2° W. Alt. 20–30 ft.
Met. data : Rainfall 81·61 in. (no real dry season).
Size of station : 210 acres.
Number of graduate research workers on staff : Nil.
Principal lines of research :

(1) Maize and cassava intercropped in coconuts to find the effect on coconuts.

(2) Legumes and grasses grown under coconuts to provide sheep-grazing.

Tono, Agricultural Station

Location : 5 miles from Navrongo. Lat. 10° 51′ N. Long. 1° 09′ W. Alt. 500–600 ft.
Met. data : Rainfall 41·38 in. (duration of dry season 26 weeks).
Size of station : 352 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

This is a field station for work by specialist staff.

Wenchi/Brong-Ahafo, Agricultural Station

Location : 95 miles N.W. of Kumasi. Lat. 7° 45′ N. Long. 2° 05′ W. Alt. 805–1080 ft.
Met. data : Rainfall 51·55 in. (duration of dry season 9 weeks). Max. shade temp. 85·6°F. Min. shade temp. 69·4°F.
Size of station : 913 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Maize, groundnuts : varietal trials. Maize : fertilizer trial. Cassava : varietal, harvesting-date trials. Yams : economics of mounds *v.* ridges and fertilizer placement trial. Cotton : sowing-date and spacing trial.

(2) Observation trials on exotic grasses and their capacity to carry stock.

(3) Grass-burning and fertilizer trials.

(4) Economics of mechanized and bullock farming.

(5) This station is mainly a cattle station. Fertilizer trials include f.y.m.

Yendi, Agricultural Station

Location : 60 miles E. of Tamale. Lat. 9° 27′ N. Long. 0° 10′ W. Alt. 640 ft.
Met. data : Rainfall 46·64 in. (duration of dry season *c.* 24 weeks). Max. shade temp. 104°F. Min. shade temp. 57°F.
Size of station : 352 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Maize, guinea corn, groundnuts, yams : varietal trials.

(3) Ranch management. Simplified prototype isolation transect experiment.

(4) Mixed farming with bullock ploughing.

Zuarungu, Agricultural Station

Location : 104 miles N. of Tamale. Lat 10° 47′ N. Long. 0° 48′ W. Alt. 600 ft.
Met. data : Rainfall 39 in. (duration of dry season 24 weeks). Max. shade temp. 107°F. Min. shade temp. 63°F.
Size of station : 200 acres.
Number of graduate research workers on staff : Work here is conducted by 3 specialists from Kwadaso and Nyankpala Agricultural Stations.
Principal lines of research :

(1) Maize, rice, cowpeas, *Hibiscus sabdariffa*. Guinea corn, early millet, late millet : stem borer investigation. Groundnuts : varietal and seed-dressing trials. Fertilizer and manurial trials.

(4) The farming system is on a 3-course rotation : early millet, guinea corn, cowpeas/late millet, cowpeas/groundnuts. No fallow period.

KENYA

Eldoret, Agricultural Experiment Station

Location : 7 miles N. of Eldoret. Lat. 0° 30′ N. Long. 35° 15′ E. Alt. 7050 ft.
Met. data : Rainfall 36 in. (duration of dry season 20 weeks).
Size of station : 400 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Wheat, rye, barley, maize, soyabeans, potatoes : varietal trials and fertilizer trials.

(2) Long-term lime trial, including grass in rotation with cereals. Bulking and trial of grasses supplied from Grassland Research Station, Kitale.

(4) Soil-fertility building by various methods. Utilization of drained vlei land.

Embu, Agricultural Investigation Centre

Location : Embu district, S.E. of Mt Kenya. Lat. 0° 30′ S. Long. 37° 25′ E. Alt. 4800 ft.
Met. data : Rainfall 41·58 in. (duration of dry season 10–12 weeks). Max. shade temp. 91°F. Min. shade temp. 45°F.
Size of station : 180 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Wheat, oats, barley : varietal and rust resistance trials. Maize : varietal trials, test crop for fertilizer trials. Beans : varietal trials for short-rains season. English potatoes : as test crop for fertilizer trials, blight resistance. Cassava : testing of disease-resistant varieties.

(2) *Setaria sphacelata, Chloris gayana, Cynodon dactylon* in mixture with *Trifolium semipilosum, T. repens* (Louisiana), *Medicago sativa* : testing persistence and management under grazing.

(3) Testing stocking rates and methods for improving natural pastures by night paddocking.

(4) Rotational trials are carried out in an attempt to determine the most effective period for a ley to restore fertility (observation only).

(5) Fodder tests with Napier grass and sweet-potatoes (tops and tubers).

Kakamega, Experimental Station

Location : 32 miles N. of Kisumu. Lat. 0° 17′ N. Long. 34° 45′ E. Alt. 5400 ft.
Met. data : Rainfall 75 in. (duration of dry seasons 15 weeks and 4 weeks). Max. shade temp. 91·0°F.
Size of station : 246 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Maize : spacing trials with and without fertilizer. Maize, soyabeans, groundnuts, cassava, potatoes : varietal trials.

(2) Observations on selected strains of grass. Observations on grass/legume grids. Establishment of the ley by undersowing or underplanting to a variety of crops and by direct reseeding or planting of splits.

(4) Comparison of continuous cultivation with a grass/arable rotation under various fertilizer treatments in a long-term experiment to evaluate the ley.

Kamasia, Pasture Research Station

Location : Marigat, Baringo District. Lat. 0° 30′ N. Long. 36° 0′ E. Alt. 3300 ft.
Met. data : Rainfall 25 in. (dry season 28 weeks). Max. shade temp. 100°F.
Size of station : Experimental work is decentralised and carried out at several centres in the district.

Number of graduate research workers on staff : 1.
Principal lines of research :

(2) Investigations on ley species and management practices suitable for introduction on African smallholdings in marginal areas. Co-operative experimentation on irrigated pastures (at Marigat).

(3) Rehabilitation of denuded lands. Control of pernicious bush species. Management of semi-arid grasslands.

(4) Development of controlled grazing systems for semi-arid grasslands.

(5) Ecological surveys. Surveys of land condition and potential.

Katumani, Experimental Farm
Location : 40 miles S.E. of Nairobi. Lat. 1° 35′ S. Long. 37° 15′ E. Alt. 5300 ft.
Met. data : Rainfall 25 in. (duration of dry seasons 8 weeks and 16 weeks). Max. shade temp. 86°F. Min. shade temp. 44°F.
Size of station : 650 acres.
Number of graduate research workers on staff : 3.
Principal lines of research :

(1) Maize : breeding to produce short-term, high-yielding white maize. Groundnuts : selection and cultivation. Maize, *Dolichos*, Sudan grass, as silage crops.

(2) Ley grasses. Rhodes grass, *Cenchrus ciliaris*, *Panicum*, star grass. Fodder grasses e.g. elephant grass and Guinea grass.

(3) Ecology of grass sward on different soil types. Influence of burning, arboricides and goats on bush. Grazing management.

Kitale, Agricultural Experimental Station
Location : Rift Valley. Lat. 1°N. Long. 35°E. Alt. 6200 ft.
Met. data : Rainfall 42 in. (duration of dry season 16 weeks). Max. shade temp. 87°F. Min. shade temp. 50°F.
Size of station : 400 acres.
Number of graduate research workers on staff : 3.
Principal lines of research

(1) Wheat, barley, maize, groundnuts, beans, grams, kale, linseed, sunflower, Niger seed : spacing, plant population, fertilizer studies.

(2) *Setaria*, Molasses grass (*Melinis minutiflora*), Rhodes grass (*Chloris gayana*) as ley grasses mixed with clovers *Trifolium johnstoni*, *T. ruepellianum*, *T. repens* (Louisiana) used in estimating carrying capacities and milk potential.

(3) District survey work to estimate carrying capacities and value for milk and beef production.

(4) Mixed. 7-course rotation : 3 years' crop/4 years' grass. Evaluating pastures through the dairy cow.

Kitale, Grassland Research Station
Location : N.W. Kenya. Lat. 1° N. Long. 35° E. Alt. 6200 ft.
Met. data : Rainfall 45 in. (duration of dry season *c.* 4–5 months). Max. shade temp. 85°F. Min. shade temp. 45°F
Size of station : 1250 acres.
Number of graduate research workers on staff : 4.
Principal lines of research :

(2) Comparison of varieties and species of grasses and legumes for use in grass leys. Special leys for use in the dry season. Investigations on the use of clover species in grasslands, and methods of establishment, management and manuring of leys.

(3) Methods of managing natural grassland for maximum production and for bush control.

(4) To find ratio of the number of years of cropping to the number of years under grass and the best alternative crops to maize for use in the district.

(5) Investigations on (a) soil deficiencies, (b) the nutritive value of grasses, legumes, fodders, trees, shrubs and feeding stuffs, (c) the ratio of N, P, S, carbohydrate and fibre in the plant at different stages of growth.

Mmea, Irrigation Research Station
Location : Embu District. Lat. 0° 40′ S. Long. 37° 25′E. Alt. 3750 ft.
Met. data : Rainfall. 30 in. (duration of dry seasons 10 weeks and 14 weeks). Max. shade temp. 94°F. Min. shade temp. 49°F.
Size of station : 500 acres.
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Wheat, maize, sorghum, rice, soyabeans, chick-peas, kenaf, sunnhemp, sunflower.

(2) Elephant grass, lucerne, velvet beans, as pure stands.

(4) (a) Irrigation farming, based on rice, on black clay soil ; (b) Irrigation farming using *Hibiscus* spp. on red loam soil ; (c) Rain farming with such crops as maize, sorghum, beans and sunflower, in rotation with a long grass break, on red loam soil.

(5) Methods of irrigation on red loam soil : inclined furrows *v.* level furrows *v.* overhead irrigation. Measurement of water requirements of various crops.

Molo, Grassland Research Station
Location : 12·5 miles S. of Molo. Lat. 0° 15′ S. Long. 35° 45′ E. Alt. 9200 ft.
Met. data : Rainfall 46·15 in. (duration of dry season *c.* 12 weeks). Max. shade temp. 73·5°F. Min. shade temp. 39·1°F.
Size of station : 450 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(2) Introduction and evaluation of grasses and legumes (temperate and tropical) for high altitude areas. Fertilizer and minor-element trials, particularly with legumes. Exploratory trials on ley management and maintenance of pasture production.

(3) Introductory trials on the effect of mowing on botanical composition. Preliminary studies on the introduction of grazing legumes into natural grasslands.

Mtwapa, Experimental Station
Location : 12 miles N. of Mombasa on Kilifi road. Lat. 3° 70′ S. Long. 39° 45′ E. Alt. 60 ft.
Met. data : Rainfall 45–60 in. (duration of dry season 12–24 weeks).
Size of station : 500 acres.
Number of graduate research workers on staff : 2.
Principal lines of research :

This is a new station which will take over the work of Matuga.

Muguga, East African Agriculture and Forestry Research Organization
Location : 17 miles W. of Nairobi. Lat 1° 13′ S. Long. 36° 38′ E. Alt. 6800 ft.
Met. data : Rainfall 38·68 in. (duration of dry season 6 weeks). Max. shade temp. 80·8°F. Min. shade temp. 41·0°F.
Size of station : Farm 450 acres (grass farm for animal husbandry experiments). Forest 400 acres (about 2/3rds experimental plantations).
Number of graduate research workers on staff : 25.
Principal lines of research :

(1) Maize and sorghum : breeding for resistance to specific diseases. General work on virus diseases, and pathogenic nematodes.

(2) Role of indigenous legumes in raising the nitrogen status of tropical soils.

(5) Mineral composition (including trace elements) of pastures, particularly some problem pastures, throughout the year, and the effect of climate and fertilizers on their composition. Estimation of fodder intake by cattle (grass and browse), and effect of pasture productivity on growth rates and carcase quality of indigenous cattle.

Ol Joro Orok, Experimental Station
Location : Laikipia district, Rift Valley Province. Lat. 0° 2′ S. Long. 36° 21′ E. Alt. 7800 ft.
Met. data : Rainfall 40·52 in. (duration of dry seasons 9 weeks and 16 weeks). Max. shade temp. 75·6°F. Min. shade temp. 40·0°F.
Size of station : 850 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Oats, vetch, lupin, fodder-beet, swedes, turnips, kale, rape : fertilizer rates for maximum yields (D.M. and protein). Fodder-beet, swedes, turnips : varietal trials.

(2) Determinations of yield and compatability of seed mixtures. New species evaluated. Evaluation of leys through milk and fat-lamb production. Value of legumes in the mixture with regard to any increase in yield from the ley (in terms of D.M. and protein). Silage mixtures, and methods of ensilage. Grass and legume seed production.

(3) Fertilizer and reseeding practices using chisel ploughs.

(4) Normal versus a feed lot or zero-grazing system.

Sotik, Experiment Station
Location : Sotik, Nyanza. Lat. 0° 42′ S. Long. 35° 06′ E. Alt. 6000 ft.
Met. data : Rainfall 51·88 in. (duration of dry season 8–10 weeks).
Size of station : 120 acres.
Number of graduate research workers on staff : 1.
Principal lines of research :

(1) Wheat, oats, barley : yield trials. Maize : population and fertilizer trials. Potatoes : fertilizer trials. Fodder crops : kale and root crops.

(2) Production from leys. Fertilizer treatment and milk production. Establishment methods under local conditions.

(4) Maintenance of fertility by the use of the ley system, green manuring, dung, etc.

LIBERIA

Suakoko, Central Agricultural Experiment Station
Location : 115 miles N.E. of Monrovia. Lat. 7° N. Long. 9° 30′ W. Alt. 750 ft.
Met. data : Rainfall 70 in. (duration of dry season 20 weeks). Max. shade temp. 96°F. Min. shade temp. 48°F.
Size of station : 470 acres.
Number of graduate research workers on staff : 6.
Principal lines of research :

(1) Maize : varietal trials. Cassava : mosaic resistant varieties. Yams : fertilizer trials.

(2) Guinea grass, molasses grass, Dallis grass, velvet beans, *Stylosanthes*, Japanese kudzu, native kudzu, *Crotalaria striata* : testing.

LIBYA

Zorda, Experimental Station
Location : El Merj (Barce), 63 miles from Benghazi, Cyrenaica. Lat. 32° 28′ N. Long. 20° 53′ E. Alt. 310 m (1017 ft).
Met. data : Rainfall 12–15 in. (duration of dry season 34 weeks).
Size of station : 1250 acres.
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Wheat (local and introduced), oats, barley (local and introduced), sorghums, fodder peas, potatoes, linseed : varietal trials. Cereals and chickpeas : sowing date, spacing and cultivation method trials.

(2) Observation plots of lucerne, vetches, oat/vetch mixtures, Sudan grass.

(4) Rotation trials have been started on farmers' lands with the object of introducing a legume into the farming system and for the production of forage ; the use of cash crops in addition to cereals ; and a study of the cultivated fallow under Cyrenaican conditions.

MOZAMBIQUE

Umbeluzi, Observation and Acclimatization Station
Location : District of Lourenço Marques. Lat. 26° S. Long. 32° 20′ E. Alt. ± 10 m.
Met. data : Rainfall ± 730 mm (28·7 in.) (duration of dry season *c.* 24 weeks).
Size of station : 2 hectares (5 acres).
Number of graduate research workers on staff : 2.
Principal lines of research :

(1) Oats, barley, *Lolium*, *Lathyrus arvensis*, *L. sativus*, *Vicia sativa*, *Trigonella*, *Melilotus alba*, *Brassica*, *Sinapis* spp.: observation and acclimatization studies.

(3) The natural grasslands of the region are of the *Themeda triandra* type and comprise *Themeda*, *Urochloa*, *Panicum*, *Botriochloa*, *Eragrostis* and *Sporobolus*. Effect of the frequency of bush fires on natural grasslands.

(*To be continued*)

FIELD CROPS

CEREALS

WHEAT

See also Abs. 97, 184, 368, 375, 389, 491.

1 Hodge, P. H. **The best method of reverting from lucerne pasture to a cultivation phase in marginal wheat areas.** *Agric. Gaz. N.S.W.* 1960, **71**, Pt 4, 202–3 and 205. [N.S.W. Dep. Agric.]

In a 5-yr experiment conducted at Condobolin Experiment Farm to determine the best way of returning a lucerne pasture to wheat cropping, it was found that for typical southern and central-western marginal wheat-area conditions, the best wheat crops were those sown on land which had been ploughed in August and then fallowed. F.S.—S.M.J.

2† Wright, G. M. **The place of better grassland management in improved wheat production.** *Proc. N.Z. Inst. Agric. Sci.* 1959, 68–74, bibl. 4. [Crop Res. Div., DSIR] [Received Sept. 1960]

The author has sought, by statistical analysis of data from several counties, for evidence that there is a connexion between the changes in average wheat yields from the various counties in New Zealand during 1933–52 and changes in the carrying capacity of grasslands effected in this period by improved management practices.—M.H.

3 Kohler, M. Untersuchungen über die Saatbettherstellung zu Winterweizen. **[Seed-bed preparation for winter wheat.]** *Landw. Jahrb. Schweiz* 1960, **74**, No. 2, 111–93, bibl. 85, illus., French summary. [Inst. PflBau, ETH, Zürich and Eidg. AgrikChem. Versuchsanstalt, Liebefeld-Bern]

The suitability of new tractor-drawn machinery which ploughs and harrows simultaneously [in one pass] was compared with horse-drawn harrows for preparing a seed bed for winter wheat. A large part of the paper is devoted to the effect of these harrows on soil structure. Their suitability for wheat was judged by uniformity in emergence of wheat, overwintering and yields. Using modern machinery, straw yields were slightly lower, and over 3 years the average grain yields were not significantly higher or lower.—D.B.

4 King, S. M. **The effect of planting date on the yields of four spring wheat varieties.** *Quart. Bull. Mich. agric. Exp. Sta.* 1960, **42**, No. 4, 733–6, bibl. 5.

The effect of 1 and 2 weeks' delay in sowing was investigated at Chatham, Michigan, in 1957–8 in Henry, Lee, Russell and Selkirk wheat given 400 lb 5–20–20 (NPK) (in 1957) and 4–12–24 (NPK) (in 1958) fertilizer/ac. The earliest sowing dates were 29 April 1957 and 2 May 1958. Average grain yields for early sowing were 37·2 bu/ac. The average reduction in grain yield from 1 and 2 weeks' delay in sowing was 4·8 and 8 bu/ac and was highly significant. Weight per bushel of grain was 2 lb lower at the latest sowing date than at the first 2 sowing dates. Although differences between yields of varieties were not significant, yields of Henry and Selkirk suffered to a greater extent from late sowing than did yields of Lee and Russell. Those that yielded most grain were Selkirk sown at the earliest date and Russell sown at the later dates.—R.B.

5 Academy of Agricultural Science of China. Kiangsu Branch. **Studies on the reasonable sowing-density of wheat plant.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 5, 431–46, English summary.

Taking into account both the development of the individual plant and production of the stand, the best density was 250,000–350,000 plants per mu [15 mu = 1 ha]. F. Eng. s.—D.B.

6 Chaudhari, B. B. and others. **Optimum seed rate in relation to grain size for rainfed (dry) wheat.** *Poona Agric. Coll. Mag.* 1959, **50**, No. 3, 171–5, bibl. 2. [Agric. Res. Sta., Niphad, Dist. Nasik, India]

Vijay produced its highest grain yield when the seed rate was 40 lb/acre and the variety N 5–67–14–26 when the rate was 60 lb/acre. The difference is accounted for by the larger seed of the latter variety. Row-spacings of 9–10 in. in Deccan and Karnatak and 12 in. in Gujarath were better than wider spacings of 15 and 18 in.—D.B.

7 Yin, H. Z. and others. **Community structure and light utilization of wheat fields.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 5, 381–97, bibl. 9, illus., English summary. [Pl. Phys. Inst., Academia Sinica, Shanghai]

8 Pendleton, J. W. and Dungan, G. H. **The effect of seeding rate and rate of nitrogen application on winter wheat varieties with different characteristics.** *Agron. J.* 1960, **52**, No. 6, 310–12, bibl. 11. [Illinois Agric. Exp. Sta., Urbana]

Knox, Pawnee, Vigo and Saline winter wheat were sown at 3 locations in 1952 and 2 locations in 1953–4 at 3, 6, 9, 12, 15 or 18 pecks/ac [4 pecks =

1 bu] and given 0, 30, 60 or 90 lb N/ac. Red clover was sown in the wheat during March at 12 lb seed/ac. Grain yield, plant height, straw yield, straw : grain ratio, date of earing, weight per bu and 1000-grain weight were influenced most by choice of variety; lodging, clover stands and percentage grain protein by rate of N; and number of fertile ears per plant by seed rate. Highest grain yields were obtained with 6 pecks seed/ac from Knox and Saline and with 9 pecks/ac from Pawnee and Vigo. Knox outyielded Saline except at 3 pecks seed/ac. Pawnee and Vigo yielded least grain. Increasing the seed rate from 3 to 6 pecks/ac or the N dressing from 0 to 30 to 60 lb/ac increased grain yields of Knox to a greater extent than those of other varieties. Clover stands were strongly reduced by N and were better under the short-strawed varieties Knox and Pawnee than under the tall varieties Saline and Vigo. The responses of the 4 wheat varieties to seed rate and N rate were not related to varietal growth characteristics.—R.B.

9 Nuñez, E. R. and others. Variaciones en la humedad del suelo durante el ciclo del trigo en El Bajío y su influencia en varias características del cultivo. [**Variations in soil moisture during the growing season of wheat in El Bajío (Mexico) and their effect on several characteristics of the crop.**] *Fol. téc. 38 Sec. Agric. Ganad., México* 1960, pp. 62, bibl. 19, English summary.

Optimal conditions of soil moisture for wheat were studied in 4 trials in 2 localities in El Bajío during 1956–9. The wheat variety Lerma Rojo was used in all the trials and was sown at 75, 90 or 125 kg/ha. The main results were as follows: (1) the moisture requirements of wheat for maximum grain yields differed (a) at pre-heading—from germination to about 5 days before heading, (b) at heading and grain formation—the month following (a), and (c) at maturity—remainder of the cycle ; (2) optimal soil-moisture stress values in the 5-30 cm horizon for irrigating wheat were 8, 5 and 16 atmospheres in shallow soil and hot, dry, windy weather, and 12, 8 and 16 atm. in deep soil and average weather, for the 3 stages of development, respectively ; (3) soil-moisture stress conditions, which reduced yields, resulted in an increase in the protein content of the grain. F. s. —E.B.O.

10 Séguéla, J. M. Enseignements à tirer de la campagne de céréales 1957–1958. Enseignements techniques à tirer de la campagne de céréales 1958–1959. [**Technical information to be drawn from the cereal seasons 1957-8 and 1958-9.**] *Tunisie agric.* 1959, Feb.–March, pp. 19 and Dec., pp. 20. [Serv. Bot. Agron., Tunisia]

Information is given on the growing of soft wheat and durum wheat in Tunisia. [See also *Fld Crop Abstr.* 13 : 2.]—E.B.O.

11 Gallarati-Scotti, G. and others. **Report to the Government of Yugoslavia on wheat improvement.** *Rep. 1184 FAO/ETAP* 1959, pp. 22.

The report includes sections on climatic and pedological conditions, results of cultural- and variety-trials, the economic aspects of wheat improvement, and the general development of agriculture in Yugoslavia. Recommendations are made. [See also *Fld Crop Abstr.* 12 : 583 and 13 : 1052.]—E.B.O.

12 Saric, M. R. La produttività dei diversi culmi di alcune varietà di frumento. [**The productivity of different tillers in some wheat varieties.**] *Sementi elette* 1960, **6**, No. 3, 38–45, bibl. 3, English and German summaries. [Inst. Agric. Res., Novi Sad, Yugoslavia]

The results are given from investigations in 1957–8 with 20 wheat varieties (local or foreign). Forty plants of each variety were grown, at a spacing of 50 × 50 cm, and 20 plants of each variety were examined. It was found that : (a) the varieties had different tillering coefficients ; (b) the duration of earing varied with the variety ; (c) the number and weight of seeds on the various tillers varied with the variety and were generally highest on the principal stem and progressively lower on the tillers.—E.B.O.

13 Bonfiglioli, O. L'apporto dei frumenti italiani nel miglioramento della granicoltura di paesi europei. [**The contribution of Italian wheat varieties to the improvement of wheat cultivation in European countries.**] *Sementi elette* 1960, **6**, No. 3, 30–7, English and German summaries.

14 Antoniani, C. Un dodecennio di prove su varietà di grano nella pianura bolognese. [**Trials over 12 years with wheat varieties in the Bologna plain (Italy).**] *Sementi elette* 1960, **6**, No. 3, 46–55, English and German summaries. [Ist. Agron. Univ. Bologna, Italy]

Tables show the yield and biological characteristics of many wheat varieties. Among the best varieties tested during the past 4 years were Campodoro, 1.Bo. 1892, Leonardo and Mara.—E.B.O.

15 Ciferri, R. and Bonvicini, M. Revisione delle vecchie razze italiane in rapporto ai frumenti mediterranei. *Triticum durum* L. (Parte terza). [**A revision of the old Italian varieties in relation to the Mediterranean wheats. *T. durum.* (Part 3).**] *Suppl. Ann. Sper. agr.* 1960, **14**, No. 3, 35–96, bibl. 27, illus., English summary. [Ist. Bot., Univ. Pavia, Italy]

Descriptions are given of 49 cultivars belonging to 9 botanical varieties, among which are the new varieties *nigro-erythromelan*, *nigromelanopus*, *obscuralbum* and *subobscurum*. Conclusions are given. [See also *Fld Crop Abstr.* 13 : 1578 and 1579.]—E.B.O.

16 Estación Experimental de Aula Dei. Spain. [**Wheat.**] *Inf. Esta. exp. Aula Dei 1958–9* [n.d.], 2, 5 and 8.

The wheat variety Toroma (formerly MM-4), which yielded well on non-irrigated land during the past few years, and the variety San Bruno (formerly H-11), which yielded more than Pané 247 under irrigation during the past 3 years, are being multiplied.—E.B.O.

17 Heyne, E. G. **Registration of improved wheat varieties, XXIII.** *Agron. J.* 1959, **51**, No. 11, 689–92, bibl. 19.

The following wheat varieties are described : Brevor, Burt, Marfed, Omar, Idaed, Lemhi, Lemhi 53, Pennoll, Russell, Centana, Rescue, Langdon, Ramsey and Elmar.—A.M.H.

18 Brun, L. H. Forsøk med høstrug og høstkveite. **Trials with winter rye and winter wheat.** *Forskn. Fors. Landbr.* 1960, **11**, No. 2, 167–86, bibl. 19, English summary. [Statens Forsøkgard Voll, Norway]

Trials between 1927 and 1947 showed that good crops of winter rye could be obtained in extensive areas of Møre and Romsdal, and in Trøndelag. The growing of rye and barley was considered to be equally profitable. Winter wheat of 11 varieties was compared with the standard variety Sigyn in 8 trials during 1948–57. Virtus was the only variety which significantly outyielded Sigyn in grain yield. Sigyn gave the highest straw yield. Follo had the weakest straw, followed by Mø 0136, Sigyn and Ergo. In 1956, the Finnish variety Vakka alone ripened sufficiently for binder harvesting. Where Virtus winter wheat was compared with Norrøna spring wheat, both varieties gave similar yields, but Virtus had the stronger straw and ripened 10 days earlier than Norrøna. Virtus, Sigyn II and Vakka were considered the most suitable varieties for the Voll district. F. Eng. s.—R.B.

19 Trentin, A. Considerazioni sulla produzione del frumento da semina in Italia. [**Considerations regarding the production of wheat seed in Italy.**] *Sementi elette* 1960, **6**, No. 3, 22–8, English and German summaries. [Ist. Genet. e Sper. Agr. N. Strampelli, Lonigo, Italy]

In Italy about 900 million kg of wheat seed is required annually for sowing about 4·5 million ha (an average of 200 kg of seed/ha). The present laws and regulations controlling seed production are inadequate, particularly in regard to establishing the qualities required of selected seeds, but a new law is being drafted. Suggested improvements are made.—E.B.O.

20 Spreafico, L. Microlesioni delle cariossidi di grano e danni alla germinabilità da anticrittogamici. [**Wheat seeds with minor injuries and damage to germinating capacity caused by fungicides.**] *Progresso agric.* 1960, **6**, No. 7, 815–25, bibl. in text, illus. [Ente Naz. Sementi Elette, Italy]

Tests were carried out in 1959 with seeds from 30 wheat samples which contained high percentages of seeds with minor injuries. It was found that these injuries did not reduce the germinating capacity, provided that they affected the seed coat only. If they affected the embryo, abnormal shoots were produced. No particularly harmful effect was produced by fungicides used at normal rates on seeds with minor injuries.—E.B.O.

21 Kirk, R. E. and Wilson, M. C. **The effect of seed treatments with phorate and other systemic insecticides on the germination of wheat.** *J. econ. Ent.* 1960, **53**, No. 4, 575–7, bibl. 4. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

The effects of phorate, di-syston and SD-3562 (dimethyl 1-(dimethylcarbamoyl)-1-propen-2-yl phosphate) as seed treatments for wheat were investigated. Rates of di-syston up to 1·5 lb/100 lb seed did not significantly reduce seed viability, while the other insecticides, especially SD-3562, were highly phytotoxic. Phorate was further tested at rates from 0·18 to 1·5 lb/100 lb seed in combination with 6 fungicides and 5 stickers. A sticker composed of 6 parts of dextrin, 3 parts sorbitol and 1 part water reduced phytotoxicity. Highest germination was obtained where arasan or captan were used. Storage of treated seed increased phorate-induced phytotoxicity ; this effect was largely due to the type of sticker employed and was least where the above sticker was used. F. s.—R.B.

22 Ledingham, R. J. and others. **Influence of cultural practices on incidence of common rootrot in wheat in Saskatchewan.** *Canad. J. Pl. Sci.* 1960, **48**, No. 2, 310–16, bibl. 11. [Canad. Dep. Agric. Res. Sta., Saskatoon, and Exp. Fm, Swift Current, Saskatchewan]

The following treatments were applied in 1951–8 in preparation for a second consecutive wheat crop : (a) spring ploughing, rolling, and sowing using a press-drill ; (b) stubble burning, cultivating, and sowing with a press-drill ; (c) one-way disc cultivation, followed by sowing with a press-drill ; (d) one-way disc cultivation and sowing in one operation. Treatment (a) reduced the incidence of root rot (caused by *Helminthosporium*

sativum) in the seedling stage, compared with the other treatments, but differences between treatments frequently disappeared by harvest. Treatment (a) increased yields significantly in 2 years out of 8.—R.B.

23 PITERBARG, R. O. Control de la "caries" de trigo con cicloheximida y sus derivados. [**Control of bunt of wheat with cycloheximide and its derivatives.**] *Rev. Invest. agric., B. Aires* 1959, **13**, No. 3, 243–56, bibl. 21, illus.

In field trials in Argentina, wet-treatment of wheat seed with the commercial preparation actidione (based on cycloheximide at 10 ppm), or with RZ (based on cycloheximide 1·3% and pentachloronitrobenzene 75% at 150 ppm), gave effective control of bunt (*Tilletia* sp.). Pure cycloheximide and some of its derivatives were also effective.—E.B.O.

24 MARSHALL, Gillian M. **The incidence of certain seed-borne diseases in commercial seed samples. 4. Bunt of wheat, *Tilletia caries* (DC.) Tul. 5. Earcockles of wheat, *Anguina tritici* (Stein.) Filipjev.** *Ann. appl. Biol.* 1960, **48**, No. 1, 34–8, bibl. 5. [Off. Seed Test. Sta., Huntingdon Rd, Cambridge]

Samples of commercial wheat seed submitted to the above Station from 1918 to 1957 have been examined for the presence of bunt balls and earcockles; the incidence of these organisms is reported. The highest proportion of contaminated samples was found in 1921 (33% with bunt balls and 9% with earcockles). Since then incidence has decreased rapidly and is now steady at less than 1% with bunt balls and nil or less than 0·1% with earcockles. The survey illustrates the effective control and almost complete elimination of a seed-borne disease and pest in the UK. No seasonal effect on the incidence of either pathogen was found nor was any varietal susceptibility to bunt detected. F. s.—M.H.

25† MINZ, G. and others. **Inoculation experiments with ergot on wheat and wild grasses.** *Ktavim* 1960, **10**, No. 1, 29–32, bibl. 4, illus.

The results obtained from tests of cross-infectability between wheat and various indigenous grasses confirm the assumption that the causal organism of ergot disease in Israel is common to wheat and wild grasses.—M.H.

26 OKIGBO, B. N. **An evaluation of hessian fly incidence and damage in wheat as affected by fertilizer treatments under field conditions.** *Diss. Abstr.* 1960, **20**, No. 11, 4235–6. [Cornell Univ., Ithaca, New York State]

Genesee winter wheat was grown at 6 locations in 1956 and '57 with 250 lb/ac 5–10–10 (NPK) fertilizer at sowing, plus an early spring top dressing of one of the following: (a) no fertilizer (1957 only); (b) 40 lb P_2O_5 and 40 lb K_2O/ac; (c), (d) and (e) as (b) plus 20, 40 and 60 lb N/ac, respectively; (f) 40 lb N/ac. Additional plots were grown at 1 location in 1958. The amount of hessian fly [*Mayetiola destructor*] infestation increased with increasing levels of N. Highest infestation and greatest loss in yield occurred in treatments (d) and (f), while the lowest infestation and yield loss occurred in treatments (a) and (b). Percentage infestation varied from 4 to 61% in 1956, 4 to 17% in 1957, and 21 to 35% in 1958. Estimated grain losses due to infestation in 1956, '57 and '58 were 5–15, 0·6–9 and 2–2·4 bu/ac, respectively. Increases in N level produced similar increases in plant population and infestation. Linear correlation coefficients between plant population and infestation at 4 locations were 0·53, 0·74, 0·82 and 0·85; similar coefficients between infestation and lodging at 4 locations were 0·83, 0·92, 0·93 and 0·94. Increases in infestation with increasing levels of N appeared to be due to the indirect effect of N on tillering rather than to oviposition preferences in *M. destructor*. Infested plants contained a slightly higher percentage of P and K than uninfested plants, probably because of the lower dry weights of the former.—R.B.

27 ROBINSON, R. J. and others. **Chloroplast number in leaves of normal wheat plants and those infested with hessian fly or treated with maleic hydrazide.** *J. econ. Ent.* 1960, **53**, No. 4, 560–2, bibl. 11. [Kansas Agric. Exp. Sta., Manhattan]

In wheat plants infested with *Phytophaga* [*Mayetiola*] *destructor*, the number of chloroplasts present in both inner and outer leaves was greater than in uninfested plants. The dark green colour of the inner leaves of infested plants was due to increased numbers of chloroplasts. Treatment of uninfested plants with 0·1% MH decreased the number of chloroplasts in outer leaves and increased the number in the inner leaves. The dark green colour of the outer leaves of plants treated with MH was due to a greater concentration of chlorophyll in the chloroplasts of these leaves. F. s.—R.B.

28 BROWN, H. E. **Insecticidal control of the hessian fly.** *J. econ. Ent.* 1960, **53**, No. 4, 501–3, bibl. 5. [Univ. Missouri, Columbia]

Wheat was treated with di-syston, phorate or American Cyanamid 12008 drilled with fertilizer at 0, 1 or 2 lb/ac to control *Phytophaga* [*Mayetiola*] *destructor* at 2 locations, approximately 1 month before the fly-free date, i.e. 7 Sept. at 1 location and 17 Sept. at the other. Phorate at 1 lb/ac gave excellent protection from attack over long exposure periods, while the other insecticides

were effective at the higher rate. Insecticides at 1 lb/ac significantly increased forage and grain yields. Seed treatment with phorate at 0·5 lb/ac caused phytotoxicity and did not increase yields.—R.B.

29 Martelli, G. M. Il baritichio, parassita del grano in spiga (*Barytychius avulsus* Faust). [***Barytychius avulsus*, a pest of wheat in the ear.**] *Ital. agric.* 1960, **97**, No. 8, 800–4, illus. [Osserv. Malattie d. Piante, Bari, Italy]

The results of trials in 1959 indicated that *B. avulsus* is controlled satisfactorily by treating wheat in the boot stage with a dust containing 1% aldrin or dieldrin, 2% lindane or 2·5% heptachlor, at 40 kg/ha.—E.B.O.

30 Wu, C. S. and Chao, T. F. **A study on dormancy of wheat varieties from various regions of China.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 6, bibl. 24, English summary. [Nanking Agric. Coll. (C.S.W.) and Inst. Pl. Physiol., Academia Sinica (T.F.C.), China]

Dormancy tests were made on 374 varieties of wheat collected from 26 provinces of China, grown at Nanking, harvested at the hard-dough stage and sun-dried to a moisture content of 12–13% before making germination tests at 5, 20, 35 and 50 days after harvest. The length of the dormancy period of varieties was studied in relation to winter or spring habit, earliness of ripening, colour of seed coat and the climate of the region in which a variety had long been cultivated. F. Eng. s. —D.B.

31 Belderok, B. Verslag van het in 1958 verrichte onderzoek aangaande kiemrust en schot. [**Report on the 1958 trial on seed dormancy and sprouting.**] *Versl. Tienjarenplan Graanonderz. 1958* 1959, 39–51, bibl. 10. [Inst. voor Graan, Meel en Brood T.N.O., Wageningen]

Wheat of 20 varieties harvested in 1958 was (a) bound in bunches of 25 ears, stored upright for 10 days in a cellar at 18°C and 100% R.H. and sprayed to runoff with water twice daily; or was threshed and germinated in petri-dishes with (b) optimum moisture, (c) 1 ml water/dish. Treatments (a) and (b) gave comparable germination values. Seven varieties (Minister, Carsten's VI, Staring, Alba, Bonus, Tavero and C.I.V. 237) gave between 37 and 5% germination in treatment (c), whereas 12 varieties (C.B.53–89, Flamingo, Heine's VII, M.G.H. 698, Leda, Cappelle Desprez, Panter, Merlin, Mado, Felix, Dippe's Triumph and Apollo) did not germinate. Comparison of the results with the α-amylase activity of grain harvested during 1953–7 from districts where moderate or severe sprouting in the ear had occurred, indicated that those varieties which germinated in treatment (c) sprouted under weather conditions conducive to both moderate and severe sprouting, and those not germinating in treatment (c) sprouted only under conditions conducive to severe sprouting and displayed varying grades of sprouting. Differences in sprouting characteristics in wheat varieties were considered to be due to differences in (1) water requirement for germination and (2) degree of retardation of germination (" dormancy ") [see *Fld Crop Abstr.* 11 : 1070]. Peko wheat was grown at 18°C during the day and 12°C during the night, except for 6 days at 25°C (w) during flowering, (x) at the milk stage, (y) during the transition from the milk to the dough stage, or (z) at the dough stage. High temperatures during stages (y) and (z) considerably increased the percentage of seed which germinated in 7 days and reduced the duration of retarded germination by about 50%.—R.B.

32 Moja, A. Ulteriori indagini sull'assorbimento dei nitrati di sodio e di calcio in plantule di frumento (*Triticum vulgare* Vill.). [**Further investigations on the absorption of sodium- and calcium-nitrates by seedlings of wheat (*T. vulgare*).**] *Ann. Sper. agr.* 1960, **14**, No. 3, 339–46, bibl. 4, English summary. [Ist. Agron., Univ. Milano, Italy]

The results from these investigations confirmed those obtained previously [see *Fld Crop Abstr.* 12 : 20].—E.B.O.

33† Schuurman, J. J. **Root development, water uptake and growth of spring wheat and perennial ray grass [ryegrass] on three profiles.** *Rep. Conf. Supplem. Irrig., Commiss. 6th internat. Soc. Soil Sci., Copenhagen 1958* Wageningen, 1959, 71–81, bibl. 7, French and German summaries. [Inst. Bodemvrucht., Groningen]

Root growth and top growth of perennial ryegrass and spring wheat on 3 profiles were studied. Data were collected on the uptake of water from various soil layers. Root growth of spring wheat reached a maximum early in the spring. Subsoil fertilizing resulted in a considerable increase of root growth, mainly in the top layer of the soil. This resulted in a higher total water uptake than on unfertilized plots. Dry matter in the tops increased in both crops up to the end of the growth period. The water absorption by spring wheat remained high from 24 May to 20 July. Maximum depth of water absorption depended partly on profile composition. F. s.—S.M.J.

34 Chinoy, J. J. **Physiology of drought resistance in wheat. 1. Effect of wilting at different stages of growth on survival values of eight varieties of wheat belonging to seven species.** *Phyton* 1960, **14**, No. 2, 147–57, bibl. 79, illus. [Gujarat Univ., Ahmedabad, India]

The wheat varieties New Pusa 165 (*Triticum vulgare*), Khapli (*T. dicoccum*), Mindum (*T. durum*), Amantka (*T. vulgare*), Persian Black (*T. persicum*),

Polish Wheat (*T. polonicum*), Exotic 25 (*T. monococcum*), Vaneum Yakub (*T. vavilovianum*), which have vegetative periods ranging between 96–105 days for New Pusa 165 and 166–175 days for Vaneum Yakub, were grown in wooden boxes filled with soil. Each variety was subjected to 4 treatments : (a) normal watering throughout the growth period ; (b) wilting at the beginning of tillering ; (c) wilting at shooting ; (d) wilting at flowering. The plants were wilted for 7 days, after which watering was resumed. The " survival value " was determined by noting the percentages of plants surviving after each wilting treatment. A highly significant inverse correlation was found between soil moisture and temperature of the wilting period, from which the " drought intensity" to which the plants were subjected was determined. An inverse correlation was also found between survival value and drought intensity. Survival values of plants subjected to wilting at shooting and flowering progressively decreased with increasing lateness of a variety on account of the increasing drought intensity. Instead, plants of all the varieties survived and made good growth when subjected to wilting at tillering because they were all wilted at the same time at a lower temperature. It was concluded that the greater susceptibility of late-flowering varieties to drought when subjected to wilting at shooting and flowering was not due to hereditary factors but mainly to the progressively higher temperature of the season, which determined a faster rate of desiccation of the soil than in the case of early-flowering varieties in which shooting and flowering stages occurred earlier in the season when temperatures were lower.—E.B.O.

35 Pauli, A. W. and Mitchell, H. L. **Changes in certain nitrogenous constituents of winter wheat as related to cold hardiness.** *Pl. Physiol.* 1960, **35,** No. 4, 539–42, bibl. 15. [Kansas Agric. Exp. Sta., Manhattan]

36 Zech, A. C. and Pauli, A. W. **Cold resistance in three varieties of winter wheat as related to nitrogen fractions and total sugar.** *Agron. J.* 1960, **52,** No. 6, 334–7, bibl. 13. [Kansas Agric. Exp. Sta., Manhattan]

Minturki, Pawnee and Ponca winter wheats were sown in pots on 29 Sept. 1958 and subjected for 16 hr to various freezing temperatures on 12 dates between Nov. and Mar. in order to determine the temperature at which 50% of plants were killed. Under Kansas conditions Minturki is the hardiest variety and Ponca the least hardy. Results of the freezing trials were in accordance with observed behaviour in the field. All 3 varieties showed a gradual increase in cold resistance from 18 Nov. to 30 Dec. Slight loss of hardiness occurred in Ponca after 30 Dec. Hardiness was at a maximum in all 3 varieties on 20 Jan. Cold resistance was significantly correlated with percentage total N in Minturki leaves and with percentage soluble protein in (1) all parts of Minturki, (2) in whole plants of Pawnee and (3) in crown tissue of all 3 varieties. Average data for all 3 varieties showed significant correlations between cold resistance and (a) percentage soluble protein for all plant parts, (b) total N in leaves and in whole plants. Percentage total sugar in Minturki leaves and plants, Ponca crowns, and in all parts of wheat plants where average data were considered was significantly correlated with cold resistance.—R.B.

37 Andrews, J. E. and others. **Interrelationships between plant age, root-rot infection, and cold hardiness in winter wheat.** *Canad. J. Bot.* 1960, **38,** No. 4, 601–11, bibl. 5, illus. [Canada Agric. Res. Sta., Lethbridge, Alberta]

38 Sato, T. and others. **Studies on the growth and yields of winter wheat in highlands. 3. Effects of high temperature in winter and early spring upon the growth and yields of winter wheat. 4. Effects of high soil temperature in winter and early spring upon the growth and yields of winter wheat.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28,** No. 3, 283–5, bibl. 8, English summary. [Kanto Tosan Agric. Exp. Sta.]

39 Ishihara, A. **Physiological studies on the vernalization of wheat plants. 2. The progress of vernalization under the field condition.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28,** No. 3, 316–20, bibl. 13, English summary. [Univ. Tokyo]

Vernalization proceeded at the same rate whether seeds were treated at 5°C or sown under field conditions with temperatures above 5°C, even when the daily mean temperature ranged between 7 and 15°C. F. Eng. s.—D.B.

40 Rajki, S. Közoňséges búzafajták tenyészideje és megváltoztatásának egyes módjai. **[Vegetation periods of some common wheat varieties and some ways of changing them.]** *Növénytermelés* 1960, **9,** No. 2, 113–30, bibl. 3, English summary 127–30. [Agric. Res. Inst. Hungarian Acad. Sci., Martonvásár]

In order to combine the useful properties of Hungarian local wheat varieties with the valuable characters of the so-called intensive varieties, use has been made not only of conventional breeding methods but also of physiological treatment. For 4 years about 100 wheat varieties were studied in the seed stage for the duration of the period required for vernalization. The duration of this period under field conditions was studied with 3 wheat varieties for 4 years. The behaviour of the varieties is described, and the relation of earliness

to yield under the Hungarian climate is discussed. The following ways of changing the vegetation period of wheat varieties have been studied : (1) crossing varieties selected on the basis of a careful analysis of their characteristic developmental phases ; and (2) transforming spring varieties (by means of special growing conditions) into new winter varieties of possibly shorter vegetation periods. The transformation of some spring varieties into true winter wheats has been achieved. An example is given in the variants obtained from Lutescens 62, Kompolti szálkás, Melanopus 69, Marquis, and the semi-winter variety Aniversario, sown at different dates from 1955 to 1958. F. Eng. s. —G.M.R.

41 Sirohi, G. S. and others. **Growth and phasic development of wheat. 3. Dry matter production and water content.** *Indian J. Pl. Physiol.* 1959, **2**, No. 2, 83–103, bibl. 8. [Dep. Bot., Univ. Delhi]

Vernalized and non-vernalized seeds of several wheat varieties were subjected to long-day (19 hr), neutral-day (11 hr) and short-day (8 hr) for varying periods. Vernalization and long-day accelerated and short-day retarded the rate of increase in fresh- and dry-weight of the whole plant. The rate of production of dry matter was much greater in early-flowering than in late-flowering varieties. Water content decreased with age of plant and the decrease was most rapid in long-day and slowest in short-day plants, thus maintaining a higher level of water in short-day plants for a longer period. The effects of vernalization and photoperiod on the production of dry matter and on the water content were correlated with the length of the vegetative period. [See also *Fld Crop Abstr.* 13 : 558.] F. s.—D.B.

42 Sawhney, K. L. and others. **Growth and phasic development of wheat. 4. Net assimilation rate and uptake of mineral nutrients.** *Indian J. Pl. Physiol.* 1959, **2**, No. 2, 116–31, bibl. 28. [Dep. Bot., Univ. Delhi]

The net-assimilation rates of short-day plants, both vernalized and non-vernalized, were much lower than those of neutral-day and long-day plants (vernalized and non-vernalized), but the rates per hour of illumination were lower under long-day treatment. This latter was accounted for by the lower intensity of the supplementary light. The content of N, P and K declined with age of the plant and this decline was more gradual in short-day plants. The decline was more gradual in the late variety *Triticum durum* var. Kubanka than in *T. vulgare* vars C 13 (early) and Lutescens (medium). The total percentages of N, P and K were much lower and the maximum was reached earlier in long-day than in neutral-day or short-day plants. The absolute rate of uptake of each of these nutrients followed the same trend. The highest maximum rates of uptake were obtained in short-day plants, but these maxima occurred later in the season than in long-day or neutral-day plants. In vernalized plants the rate of uptake was greater and the maximum occurred earlier than in non-vernalized ones. In the discussion it was shown that the uptake of nutrients appears to be governed by the developmental process of the plant. See also previous abstract. F. s.—D.B.

43 Stroun, M. and others. Relations entre la durée de la photopériode, la qualité de la lumière et le développement des céréales. [**Relationships between length of the photoperiod, quality of light and the development of cereals.**] *Bull. Soc. bot. Fr.* 1959, **106**, No. 7–8, 309–21, bibl. 14, English summary.

This study with wheat (*Triticum vulgare*) and millet (*Milium* sp.), showed that : (a) the plants were more sensitive to different wave lengths of light soon after the flower primordia had started to differentiate than at other development stages ; (b) the completion of flower induction did not lead automatically to the differentiation of the primordia ; (c) with regard to flower induction, the length of the photoperiod was partly dependent on the quality of light ; (d) radiations which favoured the "long-day effect" in wheat did not seem to be the same as in millet. [See also *Fld Crop Abstr.* 12 : 154 and 713.]—E.B.O.

44 Hoshikawa, K. **Influence of temperature upon the fertilization of wheat, grown in various levels of nitrogen.** *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 291–5, bibl. 11, illus., Japanese summary. [Fac. Agric., Univ. Tokyo]

The time required from pollination to fertilization of *Triticum aestivum* was studied cytologically under 9 combinations of temperature and manuring, viz. 30, 20 and 10°C and N at 2·6, 1·1 and 0 kg N/are. The times taken for fertilization at 30, 20 and 10°C were, respectively, 6–7, 8–9 and 11 hr. At each temperature, fertilization took place slightly earlier under the medium level of N than under the high level or no N.—D.B.

45 Coïc, Y. and Lefebvre, J.-M. Variations du taux d'azote du grain de blé. Relation avec la vitrosité des blés tendres et le mitadinage des blés durs. [**Variations of the N content in the wheat grain. Relationship with vitreosity of soft wheats and yellow-berry of durum wheats.**] *C.R. Acad. Agric. Fr.* 1960, **46**, No. 7, 369–72, bibl. 4. [Sta. Cent. Physiol. Veg., France]

46 Babajan, M. N. [**The content of carotinoid pigments in the endosperm of wheat grain in relation to variety and condi-**

tions of growth.] [Russian] *Izv. Akad. Nauk Azerbaĭdžan SSR* (*Bull. Acad. Sci. Azerbaĭdžan SSR*) 1960, No. 3, 69–75, bibl. 10.

The contents of carotinoid pigments in varieties of hard wheats fluctuates between 0·286 and 0·658 mg/100 g air-dry wt, and in soft wheats between 0·247 and 0·442. Xanthophyll is predominant in the pigments of hard wheats and in soft wheats carotene is predominant. In wheat varieties which are grown in the moist sub-tropics the content of carotinoids in the endosperm is 3 times greater than in the endosperm of grain from varieties grown in a drier climate.—M.H.

47 Avila, A. Microtécnica para extracción y valoración de la calidad de gluten en un grano de trigo. [**Microtechnique for extracting and evaluating the quality of gluten in the wheat grain.**] *Rev. Invest. agríc., B. Aires* 1958, **12,** No. 1, 57–72, bibl. 14, illus. [Inst. Fitotecnia de Castelar, Argentina] [Received Aug., 1960]

48 Gorlač, A. A. [**Biotypes of winter wheat distinguished by the length of the after-harvest ripening period of the grain.**] [Russian] *Agrobiologija* (*Agrobiology, Moscow*) 1960, No. 3, (123), 447–52. [Belocerkov Expt Sta.]

49 Department of Agriculture, Basutoland. **Growth responses to iodine.** *Rep. Dep. Agric. Basutoland 1959* Maseru, [n.d.], 50.

In the first of a series of experiments to determine the growth response of wheat and peas to iodine and their uptake of this element, both crops gave slightly increased yields, both on red and grey soils, in response to applications of I as KI.—S.M.J.

50 Coïc, Y. and Lefebvre, J.-M. Perspectives de déficience en soufre dans l'agriculture française. Carence en soufre du blé d'hiver. [**Prospects of sulphur deficiency in French agriculture. S deficiency of winter wheat.**] *C.R. Acad. Agric. Fr.* 1960, **46,** No. 7, 436–41, bibl. 2. [Sta. Centr. Physiol. Vég. INRA, Versailles, France]

51 Lawton, K. and Davis, J. F. **Influence of fertilizer analysis and placement on the emergence, growth, and nutrient absorption by wheat seedlings in the greenhouse.** *Agron. J.* 1960, **52,** No. 6, 326–8, bibl. 5. [Michigan State Univ., East Lansing]

Henry spring wheat was sown 1 in. deep in clay loam in a glasshouse with 500 lb/ac of 5–20–0 (NPK) or 5–20–20 (NPK) fertilizer containing ^{32}P applied (a) in aqueous solution sprayed on the soil surface, (b) in contact with the seed, (c) 1·5 in. below the seed, (d) 1·5 in. below and 1·5 in. to the side of the seed, (e) 1·5 in. below and 3·5 in. to the side of the seed. Where 5–20–0 was applied, the K_2O was thoroughly mixed with the surface inch of soil. Placement (b) alone significantly affected the rate and extent of seedling emergence. Seedling emergence was delayed by 3 days in treatment (b) where 5–20–0 was applied, but percentage germination was not affected. Where 5–20–20 was placed in contact with the seed, the first seedlings emerged 8 days after sowing, and percentage germination after 14 days was 62%. In the remaining treatments all seedlings emerged within 7 days. During early growth, plants in treatments (b) and (c) absorbed most P. Those in treatment (e) absorbed little fertilizer P for the first 3 weeks after sowing. After 49 days' growth, treatment (a) had supplied least P to the plants. The K content of wheat was higher where K was sprayed on the soil surface than where mixed with the surface inch of soil. Placements (c) and (d) appeared to be the most advantageous.—R.B.

52 Agerberg, L. S. Växtnäringsämnenas inverkan på skördeprodukternas kvalitet. 2. Kvävegödsling till vete. [**The influence of fertilizers on the quality of crops. 2. N dressing to wheat.**] *Medd. 107 Stat. JordbrFörsök., Uppsala 1960*, pp. 32, bibl. 31, English summary.

The results are given from trials in Sweden to study the effect on wheat of different rates of calcium nitrate applied as top-dressing. In a first series of trials with winter wheat in 1951, a year with unfavourable weather, initial dressings with 200 and 400 kg of calcium nitrate per ha were given when the young plants were 15–20 cm high. Some of the plots received an additional rate of 200 kg 2, 4 or 6 weeks later. The grain yield was raised by increased rates of dressing, which also had a strong effect on straw yield and crude-protein content, while the hectolitre weight showed a tendency to decrease with higher rates of nitrate. Late dressings caused some increase in the hectolitre weight and especially in the content of crude protein and gluten. In another series of trials (73 with spring wheat and 5 with winter wheat) in 1951–8, initial dressings with 0, 200 or 400 kg of calcium nitrate per ha were given 1 week after emergence, and additional rates of 0, 200 or 400 2 or 4 weeks later. On an average, total rates of nitrate up to 600 kg/ha increased the grain yield and especially the crude-protein content particularly with late additional dressings. In years with a cool, late spring and a dry, early summer (1951 and 1954), the grain yields without nitrate were very low, and small increases in yield and protein content were obtained with different rates of nitrate. On the other hand, in years with an early spring and favourable rainfall (1952 and 1957) grain yields were fairly high, and considerable increases in yield, protein content and hecto-

litre weight were obtained by dressing with nitrate. F. Eng. s.—E.B.O.

53 Halliday, D. J. **Nitrogenous manuring of cereals in Great Britain. A review of field experiments 1948-1958.** *Bull. 10 Jealott's Hill Res. Sta., ICI, Bracknell, Berks* 1960, pp. 39, bibl. 52.

This bulletin summarizes the results of some 350 experiments conducted, mostly during 1952–7, on winter- and spring-wheat and spring barley.—S.M.J.

54 Linser, H. and Primost, E. Können späte Stickstoffgaben im Getreidebau mit dem Traktor verabreicht werden ? [**Can the tractor be used for late applications of nitrogen in cereal cultivation** ?] *Z. Acker- u. PflBau* 1960, **110,** No. 2, 205–15, bibl. 7, illus. [Biol. Forschungsabteilung der Österreichische Stickstoffwerke A.G., Linz (Donau), Austria]

In a 4-year trial, winter wheat was sown in Oct. and, using a tractor, split applications of N were given in April, May and June (earing stage). The tractor marks in the field disappeared within about a month and, when the crop was harvested in August, there was no reduction in grain yield compared with yields after hand spreading of N fertilizer. Yields of straw, however, were somewhat lower. One year's trial of tractor manuring in a stand of winter rye gave satisfactory yields of grain and straw. The ground should not be too wet during tractor application of N. The June application by tractor requires great care.—D.B.

55 Bovay, E. Essais de fumure foliaire à l'urée sur blé d'automne. [**Trials in leaf manuring of winter wheat with urea.**] *Rev. rom. Agric.* 1960, **16,** No. 3, 27–9. [Stats Féd. Essais Agric., Lausanne, Switzerland]

This is the French version of *Fld Crop Abstr.* 13 : 1616.—D.B.

56 Bureau of Agricultural Economics, Canberra. **The Australian wheatgrowing industry. An economic survey.** *Publ. Bur. Agric. Econ.* Canberra, 1960, pp. 42.

OATS

See also Abs. 76, 89.

57 Charles, A. H. **Establishment studies. 1. The effect on spring oats of undersowing with a one-year ley.** *J. agric. Sci.* 1960, **54,** Pt 2, 179–87, bibl. 32. [Welsh Pl. Breed. Sta., Aberystwyth]

A field experiment was carried out to study the effect on spring oats of undersowing with broad red clover, Italian ryegrass and a mixture of both. Plots received 0 or 3 cwt nitrochalk/ac. Undersowing, especially with Italian ryegrass where N was applied, reduced oat shoot weight. Undersowing reduced oat plant height only where Italian ryegrass either alone or with clover was used and N was applied. Undersowing generally reduced the number of oat panicles. The effect was greatest where N or red clover was used. Red clover increased the number of whorls and the number of single-grained spikelets per panicle. Grass sown alone or with clover reduced the number of single-grained spikelets per head. Undersowing did not influence the total number of grains/panicle, 1000-grain weight, percentage husk and percentage of saleable grain. Italian ryegrass sown alone or with clover reduced the yield of straw and grain where N was applied. Yields of straw were reduced to a greater extent than those of grain. The clover alone had no effect. Yield and percentage of crude protein in the straw were reduced by Italian ryegrass grown alone or in a mixture only when N was applied. The effect of the grass was greater than that of the clover, while a mixture of both had intermediate effects. The percentage moisture in the oat sheaves was increased by undersown herbage ; red clover had a greater influence than grass. Application of N reduced the amount of clover under the oats and its adverse influence on the harvesting of the oats. In the absence of undersowing, N had no effect on the percentage moisture in the sheaves. F. s.—S.M.J.

58 Welsh Plant Breeding Station, Aberystwyth. **Pennant S227, a new variety of winter oats.** *Rep. Welsh Pl. Breed. Sta. 1959* Aberystwyth, 1960, 69.

In trials during several seasons at Aberystwyth, Pennant S227 was superior to S147 in yielding ability and standing power, its straw being stiffer and approx. 6 in. shorter. It is similar to the variety Powys in winterhardiness, tillering capacity and general panicle characteristics but the grain is similar to that of S147 in size, plumpness and milling quality. Pennant matures slightly earlier than S147 and is suitable for soils of moderate to good fertility and for land infested with stem eelworm [*Ditylenchus dipsaci*]. It has a 1000-grain weight of 36–39 g.—S.M.J.

59 Welsh Plant Breeding Station, Aberystwyth. **Manod S235, a new variety of spring oats.** *Rep. Welsh Pl. Breed. Sta. 1959* Aberystwyth, 1960, 70.

Manod S235 has a high degree of resistance to *Ditylenchus dipsaci*, *Erysiphe graminis avenae* and *Puccinia coronata*. In yielding capacity under disease-free conditions Manod is equal to Sun II and ripens slightly earlier. It produces a clean medium-length straw of superior standing ability to Sun II. Manod has a 1000-grain weight of 34–37 g.—S.M.J.

60 Rodger, J. B. A. and others. **Spring oat variety trials [in Scotland]. Low ground 1956-59 ; high ground 1957-59.** *Scot. Agric.* 1960, **40**, No. 2, 76–9. [Edinb. Sch. Agric.]

Twelve varieties were grown, with Sun II as the control. The trials were carried out on a site near Edinburgh and on 30 farms N. and S. of the Firth of Forth. Max was the only variety which outyielded Sun II in a reasonable number of trials. Nestor, W.16004 and Condor yielded similarly to Sun II. Bambu II and Ayr Commando, the only varieties exclusive to high-ground centres, were consistently outyielded by Sun II. All the other varieties were outyielded by the control. Information is given on straw length and strength, time of maturity, pests and diseases.—A.G.G.H.

61 Estación Experimental de Aula Dei, Spain. [**Oats.**] *Inf. Esta. exp. Aula Dei 1958-9* [n.d.], 4 and 7–8.

The oat variety Cartuja is being multiplied and is recommended for cultivation on both irrigated and non-irrigated land.—E.B.O.

62 Li, M.-Y. **An evaluation of the critical period and the effects of weed competition on corn and oats.** *Diss. Abstr.* 1960, **20**, No. 11, 4226. [Rutgers Univ., New Brunswick, New Jersey]

Allowing weeds to grow for longer than 1 week in oats and 2 weeks in maize reduced yields under some conditions. In oats, reduction of grain yield was associated with a reduction in the number of tillers. The yield and N content of a weedy oat crop were increased to equal, or exceed, those of a weed-free unmanured crop by applying fertilizer. A 12-in. weed-free band over the maize row did not offset the effects of weed competition. The percentage of N in maize plants was lowered where weeds were allowed to remain longer than 3 weeks after emergence. The P, K and Ca content was affected by weed competition in some cases, but not always in the same manner. Results indicated the possibility of counteracting weed competition in maize by increasing the level of fertilization where water was not a limiting factor. Weeds capable of making rapid growth during the early stages of crop development depressed crop yields to a greater extent than those later in the season. Weeds competed strongly with maize and oats for nutrients. Weeds usually contained most N, P, K and Ca during the first 2 or 3 weeks after crop emergence.—R.B.

63 Fidler, J. H. and Webley, D. ***Oscinella frit* L. in South Wales. The relationship between sowing date, plant development and progress of attack in spring oats.** *Ann. appl. Biol.* 1960, **48**, No. 1, 156–76, bibl. 23. [NAAS, Llanishen, Cardiff]

The degree of lateness of sowing of spring oats in South Wales is reflected in a proportional increase of frit-fly damage to the shoots. Late-sown crops are also more subject to heavy attacks on grain than those sown earlier. Equations are given relating the development of frit-fly attack both to the growth of the plant and to the date of sowing. F. s.—M.H.

64† Nilsson, B. Metoder för laboratoriebestämning av olika havrearter. [**Laboratory methods for identifying *Avena* species.**] *Medd. Frökontrollanst., Stockh.* 1959, No. 34, 83–4, English summary.

Besides morphological methods for identifying *Avena* species, a new method is described in which hulled presoaked seeds are stained by a 2% phenol solution. The seeds are kept on filter paper moistened by the solution in closed Petri dishes for 2·5 hr. Differences in degrees of dark staining make it possible to distinguish between species, e.g. *A. sativa* from *A. fatua*. F. Eng. s.—E.B.O.

65 Kinbacher, E. J. **Effect of freezing temperatures on pre-emerged Dubois winter oat seedlings.** *Agron. J.* 1959, **51**, No. 10, 611–12, bibl. 8. [Cornell Univ. Agric. Exp. Sta., Ithaca, New York]

Dubois winter oat seeds sown 0·75 in. deep in steam-sterilized soil began to emerge on the 6th day after sowing. Pre-emerged seedlings 1, 2, 3, 4 or 5 days old were exposed to 29 or 30°F for 24 hr. Emergence was recorded daily for 2 weeks after the freezing period. Emergence decreased substantially as the age of the seedlings at the time of freezing increased from 1 to 4 days. Emergence of seedlings treated at 5 days old was significantly greater than that of seedlings treated at 4 days old. The survival of frozen pre-emerged seedlings differed significantly in 2 different seed lots. The % dry matter and total available carbohydrates decreased as the age of seedlings increased from 1 to 5 days, while the % total N increased. The two seed lots differed in % total N but not in dry matter or total available carbohydrates. Water-insoluble N and water-soluble protein- and non-protein- N were determined for each of the 5 age groups. There was no significant difference in water-soluble protein N between the groups. There was a gradual decrease in water-insoluble N during the first 4 days and a sharp decrease on the 5th day. Water-soluble non-protein N increased gradually for the first 4 days and sharply on the 5th day.—A.M.H.

66 Nielsen, K. F. and others. **The influence of soil temperature on the growth and mineral composition of oats.** *Canad. J. Soil Sci.* 1960, **40**, No. 2, 255–63, bibl. 12. [Canada Dep. Agric., Ottawa, Ontario]

Oats were sown in pots in a glasshouse in silt loam soil, given PK, NK, NP or NPK at rates of 75 lb N, 200 lb P_2O_5 and 200 lb K_2O/ac and grown from the 5-leaf stage to maturity at soil temperatures of 41, 54, 67 and 80°F. Yields of grain and straw increased with increases in soil temperature from 41 to 67°F, and were lowest at 80°F, except in the case of the grain yield of plants given NK. Dry-matter yields at earing followed the same trend, while at the 7-leaf stage 41°F was the optimum temperature for top growth in the NP and NPK treatments and 67°F in the PK and NK treatments. Root yields tended to decrease with increasing soil temperature. Increasing soil temperature from 41 to 67°F increased uptake of N, P and K, and in many instances increased the concentration of these elements in the plant. The effect of soil temperature on nutrient uptake was more consistent for P than for N and K.—R.B.

67 Simpson, K. **Effect of soil temperature and moisture on the uptake of phosphorus by oats.** *J. Sci. Fd Agric.* 1960, **11,** No. 8, 449–56, bibl. 10. [Edinb. Sch. Agric.]

Oats were grown in pots in 2 soils, 1 high and 1 low in available P, at 2 temperatures, 2 levels of soil moisture and 5 rates of ^{32}P-labelled superphosphate. An increase of approx. 5°C in soil temperature increased the uptake of soil-P by oats, particularly on soil low in available P. Increasing the temperature also raised the uptake of fertilizer-P from the high-P soil and of total P from both soils. Lowering of soil-moisture tension to field capacity greatly increased the uptake of fertilizer-P from both soils.—S.M.J.

68 Rumburg, C. B. and others. **Effect of phosphorus concentration on the absorption of arsenate by oats from nutrient solution.** *Agron. J.* 1960, **52,** No. 8, 452–3, bibl. 5. [New Jersey Agric. Exp. Sta., New Brunswick]

Increasing concentrations of phosphorus decreased the amount of arsenate removed by oats from nutrient solution. F. s.—A.G.G.H.

69 Whistler, R. L. and Young, J. R. **The role of hemicelluloses in the oat plant.** *Arch. Biochem.* 1960, **89,** No. 1, 1–5, bibl. 14. [Purdue Univ., Lafayette, Indiana]

Under normal conditions the hemicelluloses of the oat plant function as structural components of the cell wall and not as food reserves. F. s.—E.B.O.

70 Boguszewski, W. Badania nad siewami mieszanymi łubinu zołtego z owsem. 2. Wykorzystanie przez owies azotu łubinu. **Studies on mixed crops of yellow lupin with oats. 2. Utilization of lupin nitrogen by oats.** *Roczn. Nauk rol.* 1959, **80,** Ser. A, No. 2, 225–60, bibl. 45, illus., English summary.

Four pot tests were conducted with mixed crops of lupins [*Lupinus luteus*] and oats, of which 3 were with yellow and one with blue lupins, to determine whether and to what extent oats utilize rhizobium-bound nitrogen from the lupins. The soil was light, sandy, N-deficient and low-yielding. To avoid the negative influence of shading by the lupins, 2 experiments were introduced in which lupins and oats were separately sown into the halves of the same pot. Further, various combinations of mixed crops were repeated (a) without N fertilizer and (b) with small applications of 50 or 100 mg N per pot. There was no improvement in N uptake by the oats in the mixed crops, except in one case where there was abnormal lupin development. In this case the lupins were infected by fungus disease and gave very low seed yields while the vegetative parts had an exceptionally high N content. N excretion from lupin nodules does not occur under normal conditions, but can take place under special conditions. No N intake by lupins was observed during the first few weeks of their development, i.e. before the beginning of rhizobium activity. F. Eng. s.—G.M.R.

71 Frey, K. J. **Yield components in oats. 2. The effect of nitrogen fertilization.** *Agron. J.* 1959, **51,** No. 10, 605–8, bibl. 11. [Iowa Agric. Exp. Sta., Ames]

The average yield increases of 10 oat varieties ranged from 50 to 65% when 20–80 lb N/ac was applied. The yield increase was due to the production of more heads per plant and more seeds per head. The other yield component, weight per seed, was depressed slightly but not significantly by increasing rates of N fertilization. Certain varieties responded differently to N fertilization. Marion produced relatively high grain yield increases because both number of heads per plant and number of seeds per head were stimulated, whereas Clintland responded only in number of seeds per head. In contrast, Bond produced little response to N, either in grain yield or any of the yield components. It is suggested that by determining the effect of N fertilization on the different yield components it may be possible to predict the reaction of varieties to high and low levels of N. F. s.—A.M.H.

72 Miller, M. H. and Ashton, G. C. **The influence of fertilizer placement and rate of nitrogen on fertilizer phosphorus utilization by oats as studied using a central composite design.** *Canad. J. Soil Sci.* 1960, **40,** No. 2, 157–67, bibl. 12. [Ontario Agric. Coll., Guelph]

Oats were grown in a straight line of 10 plants across metal pots 10 in. square in sandy loam soil

of pH 7 containing 150 lb available P_2O_5/ac, and given 40 lb P_2O_5/ac as ^{32}P-labelled superphosphate plus 0, 5, 10, 15 or 20 lb N/ac placed as a band 0, 1, 2, 3 or 4 in. to one side of the seed and 1 in. above or 0, 1, 2 or 3 in. below the seed. Absorption of fertilizer P was measured, using the technique described in *Fld Crop Abstr.* 13 : 1936. Fertilizer-P absorption 14 and 58 days after sowing was greatest where fertilizer was placed with the seed, but 28 and 42 days after sowing it was greatest where fertilizer was placed 1 in. to the side and 2–3 in. below the seed. The influence of fertilizer placement on the percentage of plant-P derived from the fertilizer was similar to its effect on fertilizer-P absorption. N increased fertilizer-P absorption in 28-, 42- and 58-day-old plants, and after 58 days' growth increased the dry-matter yield of tops but decreased the percentage of P present.—R.B.

RYE

See also Abs. 18, 54.

73 Statens Forsøgsvirksomhed i Plantekultur, Denmark. Forsøg med rugsorter 1956–59. [**Varietal trials with rye, 1956-9.**] *Medd. 635 Stat. Forsøgsvirk. Plantekult.* 1960, pp. 4.

During 1956–9 trials took place at 10 locations in Denmark on either clay or sandy soils with 8 varieties of rye. Petkus gave the highest average grain yield (37·8 hkg/ha) and Svaløf Værne yielded 37·2 hkg/ha. Petkus gave higher yields on sandy than on clay soils. The varieties, which also included Sejet Kærne, Borris Perle, 2 strains of Svaløf Kongs II, Tjele 56, Borris Perle 1/55 and normal-strawed Petkus, are described and data on grain- and straw-yield and straw length are tabulated.—S.M.J.

74 Andrews, J. E. **Cold hardening and cold hardiness of young winter rye seedlings as affected by stage of development and temperature.** *Canad. J. Bot.* 1960, **38**, No. 3, 353–63, bibl. 7, illus. [Canada Agric. Res. Sta., Lethbridge, Alberta]

Young winter rye seedlings, grown and hardened at 1° or 1·5°C in the dark, developed a high level of cold hardiness at 2 stages prior to emergence of the first leaf, the first when coleoptiles were less than about 1 mm in length, followed by a decrease in hardiness, and the second and higher when coleoptiles were about 15–30 mm in length (5 weeks at 1·5°C ; 7 weeks at 1°C), followed by a rapid decrease in hardiness beginning at about the time the leaf broke through the coleoptile. The use of a lower (—4°C) hardening temperature resulted in a large increase in cold hardiness at the younger stages of development, but little or no increase where seedlings had already reached a maximum of hardiness from exposure to 1·5°C for 5 weeks. In general, the response to hardening of young winter rye seedlings was similar to that found in winter wheat. [See *Fld Crop Abstr.* 13 : 1606.] F. s.—A.G.G.H.

BARLEY

See also Abs. 53, 368, 380, 389, 421.

75† Steinbrenner, K. Einfluss einer Kleegras- und Futterrübenvorfrucht auf eine Reihe messbarer Bodeneigenschaften und den Ertrag von Sommergerste. [**Effect of clover/grass and fodder-beet as preceding crops on some soil characteristics and on yield of spring barley.**] *Albr.-Thaer-Arch.* 1959, **3**, No. 1, 61–83, bibl. 39, Russian and English summaries. [Inst. Acker- u. PflBau Müncheberg/Mark, E. Germany]

Grain yields of barley were considerably higher after clover/grass than after fodder-beet. Straw yields were not influenced by the preceding crop. The effect of these preceding crops on yield components of barley was studied. Germination and the number of grains per ear were similar after clover/grass and fodder-beet, but after clover/grass, tillering capacity, density of stand and 1000-grain weight of barley were better than after fodder-beet. The superiority of clover/grass as a preceding crop is shown to be attributable to the improved soil structure which it produces. F. Ger. s.—D.B.

76 Grafius, J. E. and Wolfe, D. E. **Frost sowing of spring oats and barley.** *Quart. Bull. Mich. agric. Exp. Sta.* 1960, **42**, No. 3, 482–3.

A comparison was made in 1957 and 1958 between spring cereals sown in late Feb. or early March, when the top inch of soil had thawed, and those sown at the beginning of May. Yields of Montcalm barley were 21·8 and 20·4 bu/ac when sown late and 52 and 68·8 bu/ac, respectively, when sown early. In 1957 Jackson oats yielded 33·2 bu/ac when sown late and 73·3 bu/ac when sown early ; in 1959 Garry oats yielded 68·2 bu/ac when sown late and 88·9 bu/ac when sown early. Barley and oats were sown at 3 and 4 bu/ac, respectively, at the earlier date of sowing in order to ensure good stands. Muddy conditions were encountered during early sowing and it was found necessary to attach an iron bar to the rear of the tractor to smooth out the wheel ruts, and chains behind the drill discs.—R.B.

77 Piccioni, M. and De Marco, G. Prospettive di una nuova coltivazione : orzo distico primaverile. [**Prospects for a new crop (in Italy) : 2-rowed spring barley.**] *Sementi elette* 1960, **6**, No. 2, 29–36, illus., English and German summaries.

From trials in 1954–9 it is concluded that there are good prospects for growing 2-rowed barley for malting or fodder (grain) in many Italian regions, in lieu of wheat or of the multi-rowed barley varieties now grown.—E.B.O.

78 Horberg, Y. Die Sommergerstensorten Rika und Ingrid. Zum Anbauwert dieser letzten Züchtungsergebnisse der Saatzuchtanstalt Weibullsholm. [**The spring-barley varieties Rika and Ingrid.**] *Agric. hort. genet., Landskrona* 1960, **18**, No. 1–2, 97–108, English summary.

The spring barleys Rika and Ingrid were tested against both Herta and Ymer. Ingrid was the earliest and highest-yielding variety ; its straw had the greatest resistance to breaking and its grain had the best brewing qualities (in this respect equivalent to Carlsberg II). Rika was superior to Herta in earliness, yield, and stiffness of straw but had an equivalent brewing quality. Ingrid is replacing Rika and Herta in several European countries.—D.B.

79 Borg, G. Svalöfs Original Pallaskorn (Sv 04032), nytt 2-radskorn röntgenmutation ur Bonus. [**Svalöf's Original Pallas barley (Sv 04032), a new 2-row spring barley produced by X-ray treatment of Svalöf's Bonus barley.**] *Sverig. Utsädesfören. Tidskr.* 1959, **69**, No. 1–2, 72–96, bibl. 14, illus., English summary.

Information is given on the Swedish barley variety Pallas, which is more resistant to lodging and yields slightly more grain than Bonus. F. Eng. s.—E.B.O.

80 Wilten, W. and Coenradie, J. De veldproeven in 1959. **Field experiments 1959.** *Jaarb. NIBEM* 1960, **24**, 49–62, illus., English summary.

In trials in the Netherlands with 25 barley varieties in 1959, Carlsberg II, Ingrid, LBW 779–4, Mentor, MGH 55026, MGH 55153, MGH 55221 and MGH 55045 (Gazelle) outyielded Balder and Proctor. Delta, Union, Volla, Ingrid and Wisa had stiffer straw than Balder, while Kenia, Beka, Carlsberg II, Wisa, LBW 779–4 and Nordgaarden 119 had weaker straw than Balder. In artificial lodging trials with Balder, Ingrid and Union, lodging increased grain protein content and decreased quality in all 3 varieties. Shading a stand of Union barley to intercept 30% of the light at various stages of growth reduced grain yields. Shading after earing considerably reduced the percentage germination of the grain as determined shortly after harvest. Results contrasting sharply with those in previous years were obtained where a topdressing of 40 kg N/ha was applied to Balder barley on 16 June, 29 June or 7 July 1959. The crop was sown on 3 April with 55 kg N/ha. The earliest topdresssing, applied at the onset of earing, significantly increased grain yields (by 8%), while later dressings had no significant effect. Both June topdressings increased grain protein to a similar, significant extent ; this was ascribed to rain on 27 and 28 June following a long drought. Very little N appeared to have been taken up by the crop from the July topdressing.—R.B.

81 Wilten, W. Opbrengsten, rassenstatistiek en raseigenschappen van zomergerst. [**Yields, varietal statistics and varietal characteristics in spring barley.**] *Jaarb. NIBEM* 1960, **24**, 63–71, maps 1, English summary.

Average yields during 1959 are given for 29 barley varieties grown on 7 soil types in the Netherlands. Balder is the most commonly grown malting variety in most districts. On sandy soils Herta is the most important variety, while in the central silty clay district Minerva, Herta, and Carlsberg II are the most widely grown. Delta is currently recommended to replace Carlsberg II in both central and northern clay soils, as the latter variety is not favoured by brewers.—R.B.

82 Wilten, W. Brouwgerstverbouw in Italië. **Malting barley in Italy.** *Jaarb. NIBEM* 1960, **24**, 25–7, maps 1, English summary.

The barley variety generally grown in Italy is Skandella, a 6-rowed feeding barley. Some breweries north of Rome use Wisa malting barley, a variety which has yielded well in the European Brewery Convention trials in Italy, grown on contract with local farmers. Malting barley cultivation is developing around Brescia, Rimini, Undine, Bologna, Maremma and Rome, and at 2 locations in Sardinia. The total annual production is 500 tons. The most important characteristics required of a malting barley for Italy are early ripening and resistance to mildew in spring.—R.B.

83 Estación Experimental de Aula Dei. Spain. [**Barley.**] *Inf. Esta. exp. Aula Dei 1958-9* [n.d.], 3, 6 and 8.

The barley variety Albacete 1 is being multiplied and is recommended for cultivation on non-irrigated land in Aragon. The variety Ricla 2a, which yields more than La Almunia under irrigation, is being multiplied.—E.B.O.

84 Zohary, D. **Studies on the origin of cultivated barley.** *Bull. Res. Coun. Israel* Sect. D 1960, **9D**, No. 1, 21–42, bibl. 22, illus.

The origin of cultivated barley is explained on the basis of a " 2-row " model and *Hordeum spontaneum* is regarded as the sole ancestor of all cultivated barley forms. The mode of origin and the trends of alterations of barley under domestication are discussed. West Asia is regarded as the place of origin of barley cultivation. F. s.—M.H.

85 Humphries, E. C. **Effects of mutilation of the root on subsequent growth.** *Sci. Hort.* 1959–60, **14**, 42–8. [Rothamsted Exp. Sta., Harpenden, Herts]

Eleven days after removal of one- or two-thirds of the total root system of barley plants grown in water culture, the increment of root dry matter was the same, regardless of the amount of root removed. As the amount of root removed increased, the relative growth rates of the root increased while that of the shoot declined. When a proportion of the roots was removed from barley receiving low N, P and K, roots in low N made the least growth but the shoot growth rate was not affected. It is suggested that low N supply was already limiting growth rate before excision took place. When all the roots were removed, root and shoot growth were reduced to 56 and 42% of the control, respectively. [See also *Fld Crop Abstr.* 11 : 1720.]—s.m.j.

86 James, N. I. and Lund, S. **Meristem development of winter barley as affected by vernalization and potassium gibberellate.** *Agron. J.* 1960, **52**, No. 9, 508–10, bibl. 7, illus. [New Jersey Agric. Exp. Sta., New Brunswick]

Floral initiation and acceleration of meristem development of barley were brought about by treatment with potassium gibberellate. The accelerating effect decreased, however, with increasing age of plant, resulting in delay in heading, fewer heads produced, and induction of male sterility. F. s.—a.g.g.h.

87 Robertson, D. W. and others. **Frost injury to maturing barley.** *Agron. J.* 1959, **51**, No. 11, 658–60, illus. [Colorado Agric. Exp. Sta., Fort Collins]

Plants of Moravian barley were subjected to temperatures of 20–30°F for 1–24 hr. Each head of the plants exposed was separately tagged to indicate the stage of maturity at the time of exposure. After maturing, each head was threshed separately, and seeds of each growth stage were bulked and examined for visible damage. Germination, 100-grain weight, protein content and diastatic power were determined for visibly damaged and apparently normal kernels. Five classes of visible damage are described. The % damaged grains in samples exposed to low temperatures at various growth stages was : milk stage, 25–100 ; soft dough, 29–88 ; hard dough, 12–46 ; " turning " (heads containing ripening kernels and a few in the late hard dough stage), 0–5·3 ; ripening, 0–2·9. The various types of visible damage reduced 100-grain weight and % germination, and increased the N content of the grain. Apparently undamaged kernels which had been treated in the " pre-turning" stages weighed less and had a higher N content than those treated at later stages. The greatest frost damage apparently occurred in the first hour of exposure.—a.m.h.

88 Spahr, K. Untersuchungen über die Standfestigkeit von Sommergerste. [**An investigation of rigidity in spring barley.**] *Z. Acker- u. PflBau* 1960, **110**, No. 3, 299–331, bibl. 43, illus., English summary. [Inst. PflBau u. PflZücht., Landw. Hochsch. Hohenheim, Stuttgart/Hohenheim, W. Germany]

The causes of lodging are discussed. Lodging in spring barley was investigated by determining the effect of various factors on root breaking-point and on breaking strength of stem. Methods are described and apparatus is illustrated. Root breaking-point showed marked varietal differences; it was increased by P_2O_5, to a lesser extent by K_2O, and lowered by N. Density of stand, depth of sowing and orientation of roots in the soil did not affect lodging. The most important factor in resistance to lodging was the cellulose content of the lower two-thirds of the stem. In non-lodging varieties this value was high at flowering (the critical stage for lodging). Manuring to increase cellulose content is therefore an important means of maintaining plant rigidity. The extent of the loss in yield due to lodging depends on the stage at which lodging takes place. At flowering the yield loss is 22%, at earing 20%, and at milk-ripe stage 12%.—d.b.

89 McBeath, D. K. and Toogood, J. A. **The effect of nitrogen top dressing on yield and protein content of nitrogen-deficient cereals.** *Canad. J. Soil Sci.* 1960, **40**, No. 2, 130–5, bibl. 11. [Univ. Alberta, Edmonton]

NH_4NO_3 at 20, 40 or 60 lb N/ac was applied as a top-dressing in late June or early July 1957 and '58, or 2 weeks later, to crops of barley or oats showing symptoms of acute N-deficiency. Applying N in the early stages of plant growth promoted vegetative growth and increased grain yields. Where the N application was delayed until the emergence of the flag leaf, yields were little affected, but grain protein content was substantially increased. Yields of grain protein/ac were increased by N, irrespective of the date of application.—r.b.

MAIZE

See also Abs. 62, 320, 494.

90 Khan, A. D. **Measurement of increase in productivity by adopting soil conservation practices.** *J. Soil Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 45–50, bibl. 6. [State Conserv. Farm, Rahmankhera, Lucknow District, U.P.]

Average yield increases of maize (ears) resulting from conservation practices were nearly 40% from bunding, 66% from levelling and over 100% from both levelling and bunding. These increases greatly exceeded those obtained by the use of fertilizers or improved varieties.—D.B.

91† Gelin, O. E. V. and Gustafsson, H. Odlingstekniska försök med fodermajs i södra Sverige. **Experiments in cultivation technique with green fodder maize in southern Sweden.** *Växtodling, Uppsala* 1959, **11,** 10–25, bibl. 10, illus., English summary.

This paper presents the results and conclusions from field trials with 30 varieties of hybrid maize carried out during 1948–54. The amount of seed sown should be adjusted to the soil and climate ; 75–125 kg/ha is normal. The most suitable time for sowing is immediately after the sowing of small grains. The use of herbicides is recommended only on fields which are badly infested with weeds. Manurial trials indicate that large dressings of P and N are required. The latest harvesting dates gave the highest green-matter yields with the highest protein content. Its low protein content and its high content of crude fibre indicate that maize is not a high-quality fodder ; however, its yield of green matter, especially on poor soils, give it a certain value. F. Eng. s.—A.G.G.H.

92 Eliasson, S. Preliminära resultat av Statens Jordbruksförsöks försök med hybridmajs till grönfoder. **Preliminary results from experiments with hybrid maize for green fodder carried out at the National Agronomy Experiment Station [Sweden].** *Växtodling, Uppsala* 1959, **11,** 54–7, English summary.

93† Larsson, R. Inverkan av utsädesmängd och radavstånd pa utveckling och avkastning av ensilagemajs. **Effect of seed rate and row distance on development and yield of maize for silage.** *Växtodling, Uppsala* 1959, **11,** 44–53, bibl. 16, illus., English summary.

In trials of seed rates and row distances carried out at Ultuna in 1954/6, the yield of dry matter increased when seed rates were increased from 75 to 100 and 125 kg/ha. The 2 medium-early hybrids, KF and KC, seemed to require rows at least 45 cm apart while the yield of Eagle Hill was increased by reducing the distance to 25 cm. F. Eng. s.—A.G.G.H.

94† Åberg, E. and Larsson, R. Odlingstekniska försök med ensilagemajs i mellersta Sverige. **Cultivation experiments with hybrid maize for silage in middle Sweden.** *Växtodling, Uppsala* 1959, **11,** 26–43, bibl. 13, illus., English summary.

The following conclusions were drawn from a series of experiments with maize for silage carried out at Ultuna in 1951–4. Time of sowing should be governed by soil temperature and the risk of night frosts. The soil temperature should be ± 8°C. 100–125 kg seed per ha gave the best results. The crop should be harvested late in Sept. before the 1st frosts. Medium-early to medium-late varieties gave higher yields than early varieties. Calcium nitrate is preferable to f.y.m. as a source of N. On soils with a good P content, there is no need for added phosphates in amounts higher than those used for crops with a similar yield. F. Eng. s. —A.G.G.H.

95 Haynes, J. L. and others. **Planting methods for improved stands of corn and soyabeans on clay and silt-loam soils.** *Agron. J.* 1959, **51,** No. 11, 640–2, illus. [Ohio Agric. Exp. Sta., Wooster]

Experiments were carried out using various methods for sowing maize and soyabeans on clay soils. After winter ploughing the soil was dry and well-granulated to a depth of 2–3 in. and wet and plastic below this. When rain followed sowing in May, there were no significant differences in germination of maize following the different sowing methods, but soyabeans germinated best when 2 in. of soil were removed from the row and the seed pressed into the soil. When dry weather followed sowing in June this treatment gave the best germination and most even stands of both maize and soyabeans. On spring-ploughed clays, which usually remained cloddy, emergence was improved by pressing the seed into the soil and by additional soil preparation in the seed row. On spring-ploughed silt-loam soils, soyabeans gave the most prompt and complete germination when the surface soil over the seed row was removed, but with maize this treatment gave lower germination than conventional sowing methods.—A.M.H.

96 Burrows, W. C. **Mulch influence on soil temperature and corn growth.** *Diss. Abstr.* 1960, **20,** No. 9, 3451–2. [Iowa State Univ., Iowa City]

In the Corn Belt of the USA, maize yields are usually lower under mulch tillage than where normal plough tillage is practised. From the results of 2 field trials in Iowa, it was concluded that this effect was attributable to the relatively lower soil temperatures early in the season where mulch tillage was carried out.—P.J.B.

97† Williams, W. H. **Sabi valley experiment station. Irrigation efficiency.** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1959* Salisbury, 1960, 109.

Surface irrigation methods were investigated. For maize, the total water retained on plots 400 ft long irrigated with a 3 cusec stream per 15 ft width was 25, 19 and 10 in. for 1 : 500, 1 : 350 and 1 : 200 gradients, respectively. Reducing the flow

rate only slightly increased the amount of water retained. Furrow irrigation greatly reduced the amount of water retained, and weed growth substantially increased the water required, irrespective of gradient. In trials with wheat, the weight of straw at harvest showed a marked negative correlation and grain yield a positive correlation with the total depth of water applied.—S.M.J.

98 Collier, J. W. **Influence of cropping system-treatment combinations and climatic factors on corn yields in the Blackland area of Texas.** *Agron. J.* 1959, **51**, No. 10, 587–90, bibl. 10. [Texas Agric. Exp. Sta., Temple]

The effects of irrigation (water added whenever necessary to prevent the moisture tension 12 in. below the soil surface from exceeding 3 atmospheres), N fertilization (0 or 90 lb N/ac) and plant population (6000, 12,000 or 18,000 plants/ac) were studied on plots in which maize was grown each year from 1952 to 1957 and others in which maize followed Madrid sweet clover [*Melilotus officinalis*]. Under dryland conditions, maize after sweet clover produced higher yields than maize after maize in 5 of the 6 years, and responses to N were small and inconsistent. With irrigation, yields each year were much higher following sweet clover than following maize, but the only response to N was from the continuous maize system. Irrigation resulted in increased yields each year from plots with high fertility levels, but the amount of the increase compared with dryland conditions depended on climatic factors. The highest yields were from irrigated plots following sweet clover, but these showed a very high negative correlation with mean maximum temperature for the 3-week period after silking. The importance of considering climatic factors in crop production research in the Blackland area of Texas and other areas of similar climate is emphasized.—A.M.H.

99† Hanke, P. Über die Bedeutung von Klima und Witterung, insbesondere Temperatur und Niederschlag, für den Maisanbau. [**The importance of climate and weather, especially temperature and rainfall, for maize cultivation.**] *Albr.-Thaer-Arch.* 1960, **4**, No. 3, 226–42, bibl. 120, Russian and English summaries.

This is a review article based, mainly, on German literature. It is shown that rainfall in E. Germany is adequate in amount and distribution for maize cultivation and that temperatures, which are lower than in most maize-producing countries, may be improved by selecting soils and locations which tend to have elevated temperatures. —D.B.

100† Mehrle, W. Betriebswirtschaftliche und technische Probleme des Anbaus und der Saatguterzeugung von Hybridmais in den sud- und westeuropäischen Nachbarländern. [**Farming and technical problems in the cultivation and seed production of hybrid maize in the neighbouring south- and west-European countries (of Germany).**] *SchrReihe landw. Fak., Kiel* 1960, No. 23, pp. 56, bibl. 6, illus.

This is the report of a study tour of farms and experiment stations in Austria, N. Italy, France and Holland. It deals with the following aspects of maize growing in these countries : cultivation methods ; harvesting for green fodder, silage and grain ; storage ; marketing ; maize cultivation in a farming system ; and seed production of hybrid maize.—D.B.

101 Fenaroli, L. La produzione delle sementi ibride di mais in Italia con particolare riguardo all'esportazione. [**The production of hybrid maize seed in Italy with particular reference to exports.**] *Maydica* 1960, **5**, No. 2, 40–4, English and German summaries.

102† Andersson, G. and Lööf, B. Försöks- och förädlingsarbeten med ensilagemajs vid Sveriges Utsädesförening. **Studies of cultivation and breeding of silage maize at the Swedish Seed Association.** *Växtodling, Uppsala* 1959, **11**, 108–25, bibl. 6, English summary.

Results of variety trials carried out during 1948–57 are reported. Varieties suitable for southern Sweden are Prior (Dutch) and KC (USA). The following all-round varieties are suitable for southern and central Sweden : Orla 266, Oe 65 and 66 (Swiss) and CIV 7 (Dutch). Early, high-yielding varieties recently produced in Europe have outyielded most USA varieties, mainly because of their ability to grow in cold, cloudy weather. F. Eng s.—A.G.G.H.

103 Fenaroli, L. I nuovi ibridi I.A.B. 300 e Insubria 295 nelle prove di orientamento e dimostrative della campagna 1959. [**The new hybrids I.A.B. 300 and Insubria 295 in demonstration trials in 1959.**] *Maydica* 1960, **5**, No. 2, 37–9, English and German summaries.

In trials in central and southern Italy the maize hybrids I.A.B. 300 and Insubria 295 yielded an average of 4000 kg of grain per ha, which was 60% more than the yield of local varieties. [See also *Fld Crop Abstr.* 12 : 1178 and 1179.]—E.B.O.

104† Drozdov, N. A. and Korneev, P. K. [**Presowing treatment of maize grain with succinic acid.**] [Russian] *Kukuruza (Maize, USSR)* 1960, **5**, No. 5, 18–20, illus. [Leningrad Agric. Inst.]

Experiments made during 1954/9 have shown that presowing treatment of the seed of grain crops in weak solutions of succinic acid improves yield

and quality of the harvest. For example, in 1958 at one farm a sowing of dry maize seed gave a green yield of 34,300 kg/ha compared with 37,000 kg from seed soaked in water and 45,200 kg from seed soaked in 0·002% succinic acid. In the unfavourable weather of 1958, cobs at milk/wax ripeness were obtained from the plants on the plots sown with treated seed, but no cobs developed on the control. In 1958–9 the authors studied the effect on maize crops of treating the seed with 0·002%, 0·003%, 0·004% and 0·005% succinic acid. The controls comprised dry seed, and seed soaked in water.The succinic-acid treatment resulted in seedling emergence 3–5 days earlier than the control and the crop was less damaged by Swedish fly [*Oscinella frit*] (4–7% loss in the treated material compared with 12% loss in the water-soaked control and 15–20% in the dry control). The greatest growth in height (190 cm) was obtained from plants treated with 0·004% succinic acid.—M.H.

105 Petročenko, U. A. **Change in certain physiological and biochemical characters of maize under the effect of pre-sowing stimulation.** [Ukrainian] *Ukr. bot. Ž., Kiev (Ukrainian bot. J.)* 1960, **17**, No. 1, 40–5, bibl. 15, Russian and English summaries.

Studies have been conducted in recent years on the action of dicarboxylic and other organic acids (which are components of biogenic stimulators) on the physiological and biochemical processes in plants. The author studied the effect of pre-sowing treatment of Odesskaja-10 maize seeds with solutions of succinic and fumaric acids (concentration 0·0002 M, duration of soaking 24 hr) on the growth of the stem and leaves, chlorophyll accumulation and the catalase activity in the leaves. Treating the seeds with these acids exerts an activating effect on catalase, on the growth intensity of the stem and leaves, on the water content of the tissues and on the chlorophyll content in the leaves ; it also increases the grain yield. The most intense growth of the stem and leaves occurs, both in the experimental and the control plants, during the stages of panicle formation and flowering. The catalase activity in the leaves before panicle emergence remains low, but rises considerably during flowering. The leaves contain their highest quantity of chlorophyll during flowering. F. s.—M.H.

106 Quaglia, A. Influenza sul potere germinativo dei semi e persistenza nel terreno di alcuni erbicidi. [**Effect of some herbicides on seed germination, and their persistence in the soil.**] *Ann. Sper. agr.* 1960, **14**, No. 3, 369–83, bibl. 25, illus., English summary. [Ist. Patol. Veg., Univ. Bologna, Italy]

Field trials were carried out near Treviso, Italy, in 1959, to study the effect of some herbicides on maize. CIPC, applied at 7·5 and 15 l/ha, inhibited the germination of maize seeds for about 20 days, especially at the higher rate, but was inactive 2 months after application. Monuron, neburon and 2,4-DES had little effect on germination. Monuron at 1·5 and 3 kg/ha remained active in the soil for more than 2 months and caused a high mortality of maize seedlings. Neburon at 10 and 20 kg/ha and 2,4-DES at 2 and 4 kg/ha remained active for about a month and a half.—E.B.O.

107 Nieto, H. J. Elimine las hierbas a tiempo. [**Early control of weeds.**] *Agricultura téc., Méx.* 1959–60, No. 9, 16–18, illus.

In trials in Veracruz, Mexico, in 1955, 1956 and 1959 the maize hybrid H-503 was sown in early June on land where the principal weeds were *Echinochloa colonum*, *Eleusine indica*, *Panicum molle*, *Amaranthus* spp. and *Bidens* spp. The plots were hoe-weeded at different dates. Results showed that it is important to eliminate weeds by about the 15th day after sowing as they are particularly harmful to maize from the 25th to the 35th day.—E.B.O.

108 Director of the Highveld Region, Union of South Africa. **Influence of weeds on the growth stages of maize.** *Rep. Dir. Highveld Reg. S. Afr. 1956-7* 1959, 12.

During a dry year when precipitation from the time of emergence of the maize plants totalled 113 mm, the presence of weeds during the first 15 days after the seedlings had emerged resulted in a decrease in yield of 42·6%. A further 15 days of weed infestation caused the yield to be reduced by 76·2%. For every 15 days of weed infestation at the beginning of the growing period of maize, silk formation was retarded by 15% and tassel formation by 18·3%. Following a rainfall of 206 mm in 19 precipitations during the first 50 days after the emergence of the maize, the yield was decreased to a significant extent only where weeds were allowed to grow for 60 days before they were controlled by a cultivator ; silk formation was delayed for 9 days compared with the control.—S.M.J.

109 Montilla, J. A. Aplicación de herbicidas en maíz. [**Application of herbicides in maize.**] *Ingegn. agron.* 1959, No. 2, 14–20, bibl. 45, illus. [Serv. Shell para el Agricultor, Venezuela]

This article gives a review of results obtained in weed control in maize in the USA, and an account of investigations in Venezuela. It is concluded that treatment with 2,4-D gives good results in many cases, but in other cases, especially where grass weeds are predominant, treatment with simazin is preferable. Simazin should be applied at sowing, or up to 10 days later.—E.B.O.

110 Thayer, P. and Williams, L. E. **Effect of nitrogen, phosphorus and potassium concentrations on the development of *Gibberella* stalk- and root-rot of corn.** *Phytopathology* 1960, **50**, No. 3, 212–4, bibl. 10. [Ohio Agric. Exp. Sta., Wooster]

The effect of NPK concentration on the development of *Gibberella roseum* f. *cerealis* on maize was investigated in gravel cultures in which N at 3, 110 or 330 ppm, P at 0, 10 or 100 ppm and K at 8, 120 or 360 ppm were supplied. Increasing the level of P reduced the development of stalk and root rot. Increasing the level of N increased the development of stalk rot at medium and high, but not at low K levels, while increasing the level of K decreased stalk-rot development at low levels of N and increased it at high levels of N. N and K had no effect on root rot.—R.B.

111 Walker, P. T. **Insecticide studies on the maize stalk borer, *Busseola fusca* (Fuller), in East Africa.** *Bull. ent. Res.* 1960, **51**, No. 2, 321–51, bibl. 19. [Col. Pest. Res. Unit, Porton Down, Salisbury, England]

In field trials over 3 years to control *Busseola fusca* on maize, yields up to 2·6 times those of the controls were obtained. Endrin applied as a 2% dust or as a 0·03–0·04% emulsion spray was the most effective insecticide, 2 treatments with a 2-week interval being sufficient. Three applications of 0·05% DDT emulsion at 9-day intervals were more effective than two. An application of DDT at 2·5 oz/ac was effective for 7–10 days, while endrin at 1·5 oz/ac was effective for 14 days. Rates per application should not be less than 3·5 oz DDT or 2 oz endrin, per ac. In a high-yielding, heavily attacked area, 5% DDT dust is more economical than a 2·5% formulation. F. s.—E.B.O.

112 Simon, F. J. E. and Arellano, M. Control del barreno del tallo del maíz con insecticidas orgánicos. [**Control of stalk-borer (*Diatraea saccharalis*) on maize with organic insecticides.**] *Inf. mens. Esta. exp. agric., La Molina* 1960, **34**, No. 391, 1–6, bibl. 3.

In plot trials to test several preparations for the control of *D. saccharalis* on maize, endrin at 500 g/ha was best and gave effective control.—E.B.O.

113 Grancini, P. La lotta diretta contro la piralide del mais. [**The control of the European corn borer by direct methods.**] *Maydica* 1960, **5**, No. 2, 45–51, bibl. 11, illus., English and German summaries.

This is mainly a review of the literature on the control of *Pyrausta nubilalis* on maize by means of insecticides and the fungus *Beauveria* sp. (biological control). In preliminary trials at Bergamo, Italy, effective control of the pest was obtained in maize plots treated with *Beauveria* sp.—E.B.O.

114 Csou, J. Kukoricamoly (*Pyrausta nubilalis* Hbn.) ellenállósági vizsgálatok magyar és kínai kukoricafajtákon. **Studies on the resistance of some Hungarian and Chinese varieties of maize to the European corn borer (*Pyrausta nubilalis*).** *Növénytermelés* 1960, **9**, No. 2, 141–52, bibl. 22, illus., English summary, 151–2. [Univ. Agric. Sci., Gödöllö, Hungary]

Varietal differences in infestation were slight compared with those due to location, i.e. average infections for all the varieties grown in 3 localities were 11, 41 and 91%, respectively, while differences in infection for the varieties studied were 9, 28 and 10%, respectively. F. s.—G.M.R.

115 Chiang, H. C. and others. **European corn borer populations in relation to the estimation of crop loss.** *J. econ. Ent.* 1960, **53**, No. 4, 517–22, bibl. 18. [Minnesota Agric. Exp. Sta., St. Paul]

Studies were carried out at 3 locations during 1953–5 to analyse the relationship between mid-summer and autumn populations of *Pyrausta nubilalis* and their effect on yields of maize. It was concluded that the magnitude of the summer population was a better index for estimating yield losses than was that of the autumn population. F. s.—R.B.

116 Blanchard, R. A. and others. **Control of the corn earworm with American Cyanamid 18133.** *J. econ. Ent.* 1960, **53**, No. 4, 695–6. [Ent. Res. Div. USDA ; Texas Agric. Exp. Sta., Weslaco ; Mississippi Agric. Exp. Sta., State College]

In trials in Texas and Mississippi, American Cyanamid 18133 applied as 10% granules to cover the silks thoroughly (rate per ac not known) to control *Heliothis zea* gave 95–100% undamaged ears where 2 or 3 treatments at 3-day intervals were applied in May or between mid-June and early July. In trials in mid-July, 95% undamaged ears were obtained with 7·5% granules in 4 applications, and 57% undamaged ears where 3 applications were given. Applications of 10% granules of small, intermediate or large size in 4 applications between late July and early Aug. gave unsatisfactory control, but best results were obtained with small granules. Spraying in mid-July with 1 lb American Cyanamid 18133 emulsion, with and without 1·5 gal mineral oil/ac, at a spray volume of 25 gal/ac in each of 4 applications gave 78 and 80% undamaged ears, respectively. DDT emulsion sprayed at 2 lb a.i./ac was as effective as 10% American Cyanamid 18133 granules in May trials, and was less effective in later trials.—R.B.

117 Director of Agriculture, British Guiana. [**Control of army worm on maize.**] *Rep. Dir. Agric. Brit. Guiana 1959* British Guiana [n.d.], p. 40.

Outbreaks of armyworm (*Laphygma frugiperda*) n maize in N.W. British Guiana were controlled y spraying with 0·05 dieldrin solution.—S.M.J.

18 Dominick, C. B. **Control of the corn root webworm.** *J. econ. Ent.* 1960, **53**, No. 4, 70–5, bibl. 11. [Virginia Agric. Exp. Sta. Bright Tobacco Res. Sta., Chatham]

In experiments to control *Crambus caliginellus* attacking seedling maize, granulated aldrin, hlordane or heptachlor applied in the furrow at lb/ac were equally effective in preventing webvorm damage, and increased grain yields by bout 50%. More injury occurred where seed was reated with dieldrin than where aldrin or hepachlor at 0·5 lb/ac were mixed with fertilizer, but ield differences were not significant. Applying ldrin or heptachlor, mixed with fertilizer, in a arrow band to one side of the seed at sowing gave oor results. Granulated aldrin or heptachlor pplied broadcast at 1·8–2 lb/ac before sowing ave excellent webworm control. F. s.—R.B.

19 Peters, D. C. and others. **Preliminary evidence of resistance of high-amylose orn to the Angoumois grain moth.** *J. econ. nt.* 1960, **53**, No. 4, 573–4, bibl. 5. [Missouri gric. Exp. Sta., Columbia]

Angoumois grain moths (*Sitotroga cerealella*) ere reared on maize in pint jars in the laboratory. ars of maize containing from 0% to 75% amylose ere used. Moths placed on the high-amylose rain produced larvae that developed more slowly, ewer moths reached the adult stage, and the adults eighed less than the moths from normal maize, hich has an amylose content of about 27%. The ossibility of employing this insect for separating rain with different amylose contents is discussed. . s.—R.B.

20 Dormaar, J. F. and Ketcheson, J. W. **The effect of nitrogen form and soil temerature on the growth and phosphorus upake of corn plants grown in the greenhouse.** *anad. J. Soil Sci.* 1960, **40**, No. 2, 177–84, bibl. 13. Ontario Agric. Coll., Guelph]

Maize seedlings grown for 2 weeks in half-int cartons, 2 plants to a container, were placed, ith the roots at the bottom of the cartons exposed, n soil containing 25, 50, 100, 400 or 800 ppm N nd 50 or 200 ppm P and grown for 2 weeks at soil emperatures of 60, 70 or 80°F and an air temperaure of 85°F during illumination for 18 hr/day and 0°F when not illuminated. Top growth and P ptake were greatest where 200 ppm N were upplied. Dry-matter production by roots was nversely related to rate of N application and to otal P uptake. Ammonium-N was more effective nan nitrate-N in increasing P uptake at higher ates of N. In a similar experiment where ion-exchange resins were used in place of soil, nitrate-N was the more effective in increasing P uptake. Increasing soil temperature increased the effect of N on P uptake. [See *Fld Crop Abstr.* 11 : 822.]—R.B.

121 Mederski, H. J. and Wilson, J. H. **Relation of soil moisture to ion absorption by corn plants.** *Proc. Soil Sci. Soc. Amer.* 1960, **24**, No. 3, 149–52, bibl. 10. [Ohio Agric. Exp. Sta., Wooster]

Two-gallon containers were filled with 5 kg dry silt loam adjusted to 12·1, 13·2, 14·9, 16·1, 17·8, 19·7 or 20·8% moisture and the soil surface and exposed portion of the inside of each container covered with a wax membrane. Each container was then filled to within 1 in. of the top with 3 kg sand. Twelve seeds of Ohio W64 maize were sown in each pot and the sand was kept wet until the maize was harvested 25 days later. Every 3 days, 10 ml of a solution containing 100 ppm N and 8 ppm Fe were added. The pots were kept in a water-bath at 75°F and the plant tops in air at 50% or 98% R.H. The dry weight of plant tops and of roots developing in the soil increased linearly with increasing soil moisture. Increasing soil moisture increased the percentage and total amount of P, K and Mg in the plants ; the increases in percentage P and K were linear at low R.H. and those of Mg at high R.H.—R.B.

122 Fuehring, H. D. **Interrelationships of the trace elements zinc, boron, iron, manganese and copper on the growth and composition of corn.** *Diss. Abstr.* 1960, **20**, No. 11, 4233. [Univ. Nebraska, Lincoln]

Maize was grown in sand culture using nutrient solutions containing 5 levels of Zn, B, Fe, Mn and Cu. Using regression equations, it was calculated that maximum yields would be obtained at the following trace-element concentrations (in ppm) in the nutrient solution : 7·73 Zn, 0·185 B, 0·0045 Fe, 0·241 Mn, 0·0042 Cu. It was shown that a change in the level of any one nutrient resulted in changes in the requirement for other nutrients. The concentration of trace elements in maize tissues at the above nutrient levels were estimated (in ppm) at : 308 Zn, 19·5 B, 38·2 Fe, 49 Mn and 3·8 Cu. The following pairs of ions had a complementary effect on one another in regard to yield of maize tops : B-Fe, Mn-Cu, and Zn paired with B, Fe, Mn or Cu, while the B-Mn, Fe-Cu and B-Cu interactions were antagonistic and the Fe-Mn interaction was both complementary and antagonistic. None of these interactions significantly affected yield. The critical level for Zn in maize plants was 100 ppm, and that of B varied between 10 and 20 ppm depending on the levels of the other trace elements. When other trace elements were in balance, the Fe requirement of maize was low. Deficiency or excess of another

trace element increased the Fe requirement. The critical level for Mn varied between 50 and 75 ppm and that of Cu between 3 and 5 ppm. The percentage of P in maize plants was greatly influenced by the level of Zn in the solution, while the percentage of N, S, Ca, Mn and K was only moderately affected by the levels of trace elements. Maize appeared to have a high requirement for Zn.—R.B.

123 Ahmed, N. U. **Influence of nitrogen, phosphorus and temperature of certain phases of growth of corn.** *Diss. Abstr.* 1960, **20,** No. 11, 4253. [Univ. Wisconsin, Madison]

In studies with 2 sweet, 2 flint, 2 early dent and 2 late dent inbred maize lines, and hybrids between any 2 of these, grown in culture solution for 6 weeks, it was shown that all 4 maize types had different top/root ratios. Flint and sweet lines had higher top/root ratios than dent lines. In hybrids, the top/root ratio tended towards that of the parent with the lower ratio, although the dry weight of the hybrids was greater than that of either parent. Low levels of N and P reduced the top/root ratio in all genotypes, in the case of P to a greater extent in inbreds with high top/root ratios. Compared with alternating temperatures of 68–88°F, a constant temperature of 80°F increased, and alternating temperatures of 58–78°F decreased, the top/root ratio. The constant-temperature and 58–78°F alternating-temperature treatments retarded root growth and top growth respectively. The top/root ratio varied inversely with the number of permanent adventitious roots produced.—R.B.

124† Åberg, E. Studier rörande köldtolerans hos majs. **Studies of cold tolerance in maize.** *Växtodling, Uppsala* 1959, **11,** 126–48, bibl. 14, illus., English summary.

Cold tolerance depends on (1) ability to emerge from cold, wet soils and (2) ability to grow at low temperatures. The subject was studied by the Department of Plant Husbandry, Uppsala, during 1955–8, when the reaction to cold of 6 maize varieties was studied in the field. Results are given. It is concluded that it seems impossible to elucidate the problems concerning cold tolerance in maize without further studies to determine the retarding effect of low temperature. Heat units (temperature grade sums) cannot be determined for maize so long as the effect of temperatures below 7°C is unknown. F. s.—A.G.G.H.

125 Starkova, A. V. [**Increasing the drought resistance and yields of maize.**] [Russian] *Vestn. Akad. Nauk Kazah SSR* (*J. Acad. Sci. Kazah SSR*) 1960, **16,** No. 7, 103–4.

In northern Kazahstan the deficiency of water and the low temperatures make conditions unsuitable for maize. During 1956–9 in the Šortandinsk area of the Akmolinsk Province [52°N., 70°E.) where the climate is the dry continental type, a study was made of the characteristics of maize grown from seed treated by Henkel's method (*Fld Crop Abstr.* 9 : 404). It is concluded that the late-ripening variety Almaatinkaja 236 could be grown in northern Kazahstan if the seed is produced in unirrigated areas of the southern regions and treated by Henkel's method. The characteristics of unirrigated maize are : high photosynthetic productivity, low water requirements and high yields of green matter (12,750 kg/ha). Sowing rate should be 2 seeds per pocket both for early and late varieties. Photosynthetic productivity (in g of dry matter/1 sq.m leaf surface/day) with 2 plants per pocket was 9·1 g, compared with 2·5 g with 8 plants/pocket. Dry-matter yield was 2·5 g/sq. m leaf surface/day.—M.H.

126 Stinson, H. T. and Moss, D. N. **Some effects of shade upon corn hybrids tolerant and intolerant of dense planting.** *Agron. J.* 1960, **52,** No. 8, 482–4. [Connecticut Agric. Exp. Sta., New Haven]

Six maize hybrids tolerant, and 5 hybrids intolerant, of high populations were tested for their response to a shade environment under conditions of adequate soil moisture and fertility. In shade, the grain yield of the tolerant hybrids as a group was significantly higher than that of the intolerant hybrids. Ear barrenness contributed more to the differential yield response of the tolerant and intolerant hybrids than did reduction in ear weight. F. s.—A.G.G.H.

127 Walden, D. B. **Preliminary studies on longevity of corn pollen and related physiological factors.** *Diss. Abstr.* 1960, **20,** No. 9, 3488–9. [Cornell Univ., Ithaca, New York State]

A method for the bio-assay of maize pollen for viability is described. Pollen longevity was influenced by the storage temperature and moisture content at the beginning of storage and was maintained for at least 200 hr in a number of samples stored at temperatures from −8°C to +5°C. Studies on the respiration of maize pollen are also reported.—P.J.B.

128 Grzesiuk, St. and others. Cukrowce rozwijającego się ziarna kukurydzy zwykłej (*Zea mays* ssp. *indurata*). **Sugars of developing grain in maize (*Z. mays* ssp. *indurata*).** *Hod. Roślin. Aklimat. Nasien.* (*Pl. Breed. Acclim. Seed Prod.*) 1960, 4, No. 2, 97–110, bibl. 22, English summary.

It was sought to determine to what degree physiological development by stages in the maize grain is the result of changes in the carbohydrate content. Analysis was made of grain of different degrees of maturity, just threshed, and of grain

stored for a year in the cob. Samples were taken every 4 days from pollination up to full maturity. The sugars were determined by means of paper chromatography (qualitatively) and by chemical methods (quantitatively). The following conclusions were drawn. Qualitative changes in the sugars of the grain at maturity are mostly independent of the physiological stages in the grain. These stages are more dependent on quantitative changes in carbohydrates, soluble and non-soluble in water. The dynamics of the sugars in the developing grain do not account for differing degrees of vitality or yield capacity. F. Eng. s.—G.M.R.

129 Ostaščenko, V. **[Maize with cobs in the Altaï.]** [Russian] *Sel'hoz. Sibiri* (*Agric. Siberia*) 1960, **5**, No. 2, 18–23, illus.

130 De Muelenaere, H. J. H. and Quicke, G. V. **The effect of fertilizer applications to maize on the quality of the seed crop.** *S. Afr. J. agric. Sci.* 1960, **3**, No. 2, 307–9, bibl. 5, illus. [Agric. Fac., Univ. Natal, Pietermaritzburg]

131 Lawton, K. and Patino, E. **Fertilizer studies in the Cauca Valley of Colombia.** *Proc. Soil Sci. Soc. Amer.* 1960, **24**, No. 3, 202–5, bibl. 9. [Michigan State Univ., East Lansing and Univ. Nac., Palmira, Colombia]

Fertilizer trials were carried out during 1957–9 with maize, soyabeans and cotton near Florida, Colombia. At 1 location where 8 rates of N and 7 rates of P were applied to maize, 40–60 lb P_2O_5/ac significantly increased yields, while higher rates decreased them. N had no significant effect. At another location, maize was grown with or without irrigation at (a) 11,200, (b) 16,000 or (c) 18,500 plants/ac and given 0, 50, 100 or 150 lb/ac of N, P_2O_5 and/or K_2O. Irrigation increased average maize yields (a) from 60·7 to 72·9 bu/ac, (b) from 75·1 to 94 bu/ac, (c) from 65·9 to 89·5 bu/ac.—R.B.

132 Reichman, G. A. and others. **N and P composition and yield of corn as affected by fertilization.** *Agron. J.* 1959, **51**, No. 10, 575–8, bibl. 15. [Deep River Development Fm, Upham, N. Dakota]

The effect of N and P fertilization on yield and nutrient composition of maize grown under irrigation was studied in 1953–7. The relationships between yield and plant-nutrient composition were also evaluated. Determinations of N and P content were made on grain and stover sampled at harvest time and on leaves selected at the time of pollination. In the presence of added P (11 or 22 lb/ac), forage and grain yields were increased by application of N at rates up to 80 lb/ac. In the presence of added N, P also increased production. Fertilization increased N and P percentages in leaves, grain and stover. The N and P percentages in leaves sampled at pollination were closely correlated with yields and with the total nutrient uptake values at harvest. Leaf N was the dominant indicator of yield, but leaf P was also important. The N and P percentages in the leaves were positively correlated. Critical N levels in the leaves, i.e. the concentration of N above which yields did not increase appreciably, varied from year to year. Critical P percentages were not clearly defined. F. s.—A.M.H.

133 Lanza, F. La concimazione azotata al mais. 1. Ricerche agronomiche. **[The N manuring of maize. 1. Agronomical investigations.]** *Maydica* 1960, **5**, No. 3, 67–85, bibl. 24, English summary. [Sta. Sper. Maiscolt. Bergamo, Italy]

Federico, L. La concimazione azotata al mais. 2. Ricerche agrochimiche. **[The N manuring of maize. 2. Agrochemical investigations.]** *Maydica* 1960, **5**, No. 3, 86–112, bibl. 17, English summary. [Ist. Chim. Agr., Univ. Milano, Italy]

Note 1 gives results from agronomical investigations in 1956–9 and note 2 gives preliminary results from chemical determinations carried out on the grain and leaves of maize in 1959. General conclusions are given from the 2 notes. The grain yield increased with increasing amounts of N applied up to 200 kg N/ha, with corresponding increases in the content of protein in the grain and of N in the leaves, and a corresponding shortening of the vegetative cycle of maize. N was generally more effective when applied late. F. concl.—E.B.O.

134 Pronin, M. E. and Afanas'ev, M. V. **[Maize fertilizers, on chernozem.]** [Russian] *Kukuruza* (*Maize, USSR*) 1960, No. 6, 22–3. [Voronež Agric. Inst.]

Results of a 3-year experiment on the effect of fertilizer on grain yield of the maize variety Voronežskaja 76 are reported. The fertilizer comprised 15 kg/ha N, 25 kg P_2O_5 and 20 kg K ; the soil was a leached chernozem. It is shown that the nutrients supplied at the 4th-leaf stage produce the best grain yield (2-yr average = 3560 kg/ha). If fertilizers are given at the 7–8 leaf stage, they should be placed at a distance of 30 cm from the crop.—M.H.

135 Heikkinen, T. **The influence of boron on the yield, growth and structure of corn ; the boron content of some Wisconsin waters.** *Diss. Abstr.* 1960, **20**, No. 10, 3909. [Univ. Wisconsin, Madison]

The effects of B deficiency on the incidence of barrenness in maize was investigated. Field studies on soils low in B indicated that lack of B was not

the cause of blank stalks or reduced yields. In 47 farm trials, B fertilizers had no effect on maize yields or incidence of blank stalks. In most cases where the incidence of blank stalks was high, severe mid-season drought caused actual death of many maize plants. Maize was grown in nutrient solutions containing 0, 0·03 or 0·25 ppm B. Absence of B during the early stages of growth caused severe damage to tassel tips, while at later stages it also caused damage to ear branches. Plants grown without B for the first 4 or 6 weeks and then given 0·25 ppm B contained as much B as plants not initially deprived of B, but only in the latter plants did the grain develop normally.—R.B.

136 Bravo, G. and others. Ensayos de insecticidas en polvo para la protección de granos almacenados. [**Trials with insecticidal dusts for protecting stored grain.**] *Agric. trop., Bogotá* 1960, **16**, No. 5, 300–12, bibl. 4.

From trials at 3 agricultural experiment stations in Colombia in 1957, it was concluded that lindane 5 ppm, malathion 8 ppm and a mixture of piperonyl butoxide plus pyrethrins 17 : 1 ppm, were equally effective and gave satisfactory control of pests in maize stored for 6 months. The germinating capacity of the seed was not affected.—E.B.O.

SORGHUMS AND OTHER MILLETS

137 Khan, R. D. **Measurement of increase in productivity by adopting soil conservation practices. 2.** *J. Soil Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 51–5, bibl. 1. [Pilot Soil Conserv. Project, Halwapur, Lucknow District, U.P.]

Average yield increases of *Sorghum vulgare* resulting from bunding, levelling and combined bunding and levelling were 29, 42 and 76%, repectively. F. s.—D.B.

138 Porter, K. B. and others. **The effect of row spacing, fertilizer and planting rate on the yield and water use of irrigated grain sorghum.** *Agron. J.* 1960, **52**, No. 8, 431–4, bibl. 5. [S.W. Gt Plains Fld Sta., Bushland, Texas]

Irrigated grain sorghum grown in 12- or 20-in. rows produced significantly higher grain yields and produced more grain per inch of water used than in 30- or 40-in. rows. This was attributed to a more uniform spacing of plants, which resulted in more efficient use of moisture, nutrients, and solar energy. F. s.—A.G.G.H.

139 Bardía, B. R. Sorgos híbridos para grano. [**Hybrid sorghums for grain (in Spain).**] *Bol. agro-pec.* 1959, Jul.-Sept., 56–69 and Oct.–Dec., 75–92, illus. [Esc. Agric., Barcelona, Spain]

140 Naldi, L. I sorghi ibridi nel 1959. [**Hybrid sorghums in 1959 (in Italy).**] *Sementi elette* 1960, **6**, No. 2, 40–4, illus., English and German summaries.

141 Wing, M. M. A. Dos cosechas de sorgo con una sola siembra. [**Two sorghum crops from one sowing.**] *Agricultura téc., Méx.* 1959–60, No. 9, 11–12, illus.

In trials in Obregón, Mexico, the sorghum varieties E[arly] Hegari, DD 38 Milo and Redbine 2, sown on 1 or 15 Apr., or 1 May, yielded from 7·5 to 9·5 metric tons of grain per ha in 2 crops, the second, or ratoon crop, being harvested 82–101 days after the first.—E.B.O.

142 Carlson, G. E. and Atkins, R. E. **Effect of freezing temperatures on seed viability and seedling vigor of grain sorghum.** *Agron. J.* 1960, **52**, No. 6, 329–33, bibl. 10. [Iowa Agric. Exp. Sta., Ames]

Seeds of the sorghum varieties Norghum, Combine kafir-60 and the hybrids RS 501 and RS 610 (at 10·5, 20, 25, 30 or 35% adjusted moisture content) were kept at 45, 26, 20 or 14°F for 4, 8, 16, 36 or 72 hr and sown in a glasshouse. Grain of the same varieties harvested at (a) 10–15, (b) 20–25, (c) 30–35, (d) 40–45% moisture was similarly treated except for the 72-hr exposure to low temperatures, thawed for 24 hr at 45°F, dried and stored at room temperature for 2–3 months and treated with captan 75 at 1–1·5 oz/bu before sowing. Grain containing 10–20% moisture was not affected by treatment, while percentage germination of grain containing 30–35% moisture was markedly reduced by freezing. The reduction in percentage germination resulting from freezing treatment of seed containing 20–25% moisture varied between 0 and 50%. Freezing treatment had no significant effect on seedling vigour, but in the experiment with maturing grain the percentage of weak seedlings increased with increasing moisture content. Combine kafir-60 was less affected by freezing treatments than other varieties. Results with maturing and with moistened grain differed to some extent.—R.B.

143† Akazawa, T. and others. **Studies on cyanogenic glycoside of *Sorghum vulgare*.** *Pl. Physiol.* 1960, **35**, No. 4, 535–8, bibl. 8. [Dep. Biochem., Univ. California, Davis]

A method for germinating uniform, etiolated seedlings of *Sorghum vulgare* is described. The glycoside is localized in the aerial shoots of the plant. Seeds of sorghum do not contain the glycoside, but 3-day-old etiolated seedlings may contain as much as 15μ moles per g fresh weight. The 5-day-old green seedling contains approximately the same amount of glycoside, but the amount decreases as the plant increases with age. F. s.—A.G.G.H.

144 Herron, G. M. and Erhart, A. B. **Effects of nitrogen and phosphorus fertilizers on the yield of irrigated grain sorghum in southwestern Kansas.** *Agron. J.* 1960, **52,** No. 9, 499–501, bibl. 10. [Garden City Br., Kansas Agric. Exp. Sta., Garden City]

145 Mathers, A. C. and others. **Relationship of nitrogen and grain sorghum yield under three moisture regimes.** *Agron. J.* 1960, **52,** No. 8, 443–6, bibl. 6. [S.W. Gt Plains Fld Sta., Bushland, Texas]

This study indicated that sorghum yields can be predicted from nitrate analyses. A sampling depth of 4 ft seems necessary. Soil tests for N are of limited value in semi-arid or arid areas without irrigation. Near maximum yields were obtained from 140 lb nitrate per ac. F. s.—A.G.G.H.

146 Gopalakrishnan, S. **Copper nutrition of millets. (2).** *Madras agric. J.* 1960, **47,** No. 3, 95–108, bibl. 31. [Madras Agric. Coll. and Res. Inst., Coimbatore, S. India]

This paper publishes the graphs and tables supporting the findings given in *Fld Crop Abstr.* 13 : 1682. Further, chemical analysis of the leaves of these millets (*Sorghum vulgare, Eleusine coracana* and *Pennisetum typhoideum*) shows the effect of the level of Cu nutrition on the intake of N, P, K, Ca, Mg and Fe and on the content of reducing sugars.—D.B.

147 Narayanan, T. R. and Menon, K. V. **Effect of presoaking seeds in phytohormonal solution on the growth and yield of crops.** *Madras agric. J.* 1960, **47,** No. 4, 159–65. [Madras Agric. Coll., Coimbatore, S. India]

Pre-soaking seeds of *Eleusine coracana* with IAA and NAA at a concentration of 50 ppm did not cause a difference in plant height or number of tillers when plants were fully grown, nor was there a difference in [time of] flowering, but grain yields increased by 2·5 to 5%. NAA applied before flowering as a foliar spray at 20 ppm had an adverse effect on grain yield. Non-significant increases in straw yield (2·8–21·7%) were obtained when growth substances were used for soaking seeds or as foliar sprays. Results with *Oryza sativa* grown at 2 locations were not consistent. See also *Fld Crop Abstr.* 12 : 128.—D.B.

RICE

See also Abs. 147, 245.

148 FAO. **Report of the eighth meeting of the Working Party on Rice Production and Protection of the International Rice Commission, held at Peradeniya, Ceylon, 14–19 December, 1959.** *Meet. Rep. 1960/PL5 FAO* 1960, pp. 50.

At the 6th session of the International Rice Commission held in Tokyo in 1958, it was decided that a Working Party on Rice Production and Protection should be established to continue and widen the work of the previous Working Party on Rice Breeding. The first meeting of this reorganized Working Party (the 8th in the series of meetings) was attended by delegates from 16 Governments. This report gives a summary of discussions and recommendations, and a list of papers presented.—E.B.O.

149 Instituto Rio Grandense do Arroz. 15°. Anuário estatístico do arroz. Safra 1958–1959. [**15th statistical yearbook on rice. 1958–9 harvest year.**] 1960, pp. 112, map.

Tabulated information is given on rice growing in Rio Grande do Sul, Brazil.—E.B.O.

150 Angladette, A. Notes sur la riziculture à Ceylan. [**Notes on rice growing in Ceylon.**] *Riz et Rizicult.* 1960, **6,** No. 2–3, 65–93, bibl. 90, illus., English and Spanish summaries.

151 Guillaume, M. Les aménagements hydro-agricoles de riziculture et de culture de décrue dans la vallée du Niger. [**The hydrological-agricultural management of rice growing, and of crops grown after floods, in the Niger valley (Republic of the Sudan).**] *Agron. trop., Paris* 1960, **15,** No. 1, 73–91, No. 2, 133–87 and No. 3, 273–319, illus.

This article was prepared from a report of a mission undertaken by the author, in 1958–9, to study land utilization in the Niger valley, which is subject to floods, and the possibilities of improving it by means of hydrological-agricultural management. The Africans grow rice on the flooded land, and sorghum, and, to a lesser extent maize and sweet-potatoes, after the flood water has receded.—E.B.O.

152 Tai, Y. L. and others. **Physiological basis for production of healthy rice seedlings with an improved type of seedling bed.** *Acta Agric. sinica* 1960 **11,** No. 1, 57–62, bibl. 6, English summary. [Peking Inst. Pl. Physiol., Academia Sinica]

In the seedling bed designed for the Po-hai area, rice seeds are allowed to germinate on moist soil, and the seedlings are not flooded until (or after) the emergence of the first true leaves. At this stage the land is covered with water to a depth which does not completely submerge the leaves. This incomplete covering of water prevents both high salinity and low temperature, and exposure of the leaves provides conditions for formation of aerenchyma through which air passes from leaf stomata to roots. F. Eng. s.—D.B.

153 Tszjansi [Shan-si] Province, Agricultural Institute. **[The rational density of early rice sowings.]** [Chinese] *Acta Agric. sinica* 1960, **11**, No. 1, 90–9.

154 Thambiayah, S. **Mechanical devices for row-seeding swamp rice.** *Trop. Agriculturist* 1959, **115**, No. 2, 95–120, illus. [Agric. Implement Test. Comm., Dep. Agriculture, Ceylon]

Eighteen simple implements for drilling swamp rice by peasant cultivators are described.—E.B.O.

155 Piacco, R. Prove di trapianto meccanico. Il trapianto manuale nelle parcelle testimonio. **[Trials in mechanized transplanting. Hand transplanting in control plots.]** *Riso* 1960, **9**, No. 4, 13–15, illus.

In trials on mechanized transplanting of rice carried out in N. Italy in 1959, the control plots were transplanted by hand. Data obtained from 21 of these control plots are reported ; they are concerned with length of plants at transplanting (average 36 cm), their age (average 49 days), final number of transplanted plants per m^2 (average 269) and grain yield (average 6940 kg/ha). The highest yield of 8040 kg/ha was obtained with 302 plants per m^2. These data should be taken into account in the construction of transplanting machines.—E.B.O.

156 Ubels, E. and others. Rijst. Rotatie. **[Rice. Rotation.]** *Jaarversl. LandbProefst. Suriname 1959* 1960, 34–6.

The effect of the following crops, grown on ridges or on level land at 2 locations between Dec. 1958 and mid-April 1959, on the succeeding rice crop was investigated : (a) fallow ; (b) *Crotalaria quinquefolia* as green manure ; (c) *Vigna sinensis* ; (d) *Phaseolus radiatus* ; (e) Para grass (*Brachiaria* [*Panicum*] *purpurascens*). Good drainage and irrigation were considered very important for successful cropping during the dry season. Para grass and *C. quinquefolia* developed better on level land than on ridges, while *V. sinensis* and *P. radiatus* grew slightly better on ridges. *C. quinquefolia* gave substantially better yields of green matter than did the other crops. Rice yields were highest following *C. quinquefolia* grown on ridges, probably because of the more intensive cultivation used where this method was employed. Para grass began to come up again about 1 month after the rice harvest in rotation (e).—R.B.

157 Piacco, R. Introduzione di varietà di riso U.S.A. **[Introduction of rice varieties from the USA.]** *Sementi elette* 1960, **6**, No. 2, 12–20, illus. [Sta. Sper. Risicolt., Vercelli, Italy]

Of 35 rice varieties introduced from the USA and grown in Italy in the course of several years, only 8 reached maturity. Of these several are unsuitable for cultivation in Italy because of low yields and the narrowness of their grain. The var. Originario Lencini, obtained from the var. Cody, is resistant to lodging and disease and should replace the var. Americano 1600 now widely grown. [See also *Fld Crop Abstr.* 10 : 953.]—E.B.O.

158 Mastenbroek, J. J. Rijst. Observatie-aanplantingen. **[Rice. Observation plantings.]** *Jaarversl. LandbProefst. Suriname 1959* 1960, 37.

In small-scale trials with 165 rice varieties, the 10 varieties giving the highest grain yields (expressed as a percentage of the yield of var. Dima) were : VD 5040/2/1/13 (114·7%) ; K8C/263/1/(116%) ; K8C/263/3 (116·5%) ; K8C/140/72/1 (111·2%) ; K10B/100/2 (111·3%) ; K12C/48 (117·5%) ; K12C/53 (128·1%) ; K12C/81 (111·3%) ; K12C/83 (121·9%) ; K12C/112 (113·7%). The last 5 of these varieties have hairless leaves, lemmae and paleae and have been, so far, almost immune to mould growth on the leaves.—R.B.

159 Mastenbroek, J. J. Rijst. Rassenproeven. **[Rice. Varietal trials.]** *Jaarversl. LandbProefst. Suriname 1959* 1960, 38–9.

In trials in Surinam, 101 varieties of rice were compared with the standard varieties Skrivimankoti, Dima and/or Holland 5023. Skrivimankoti gave the highest yields in all the trials in which it was included. Of the varieties tested, 27 were selected for further study. Results are given of varietal trials with 24 varieties at 6 locations.—R.B.

160 Dasananda, S. **Method of reducing the number of [rice] varieties in Thailand.** *Internat. Rice Comm. News Lett.* 1960, **9**, No. 1, 7–11.

In a programme for rice improvement a large number of varieties are tested and a few superior ones retained. In trials in 26 localities in N.E. Thailand during 1956–8, the glutinous variety Daw Nahng Nuan yielded best. This variety, harvested in late Nov., has a good quality grain and is recommended for multiplication and distribution to farmers. Two non-glutinous varieties, Leuang Yai 34 (harvested in early Dec.) and Khao Dawk Mali (harvested in late Nov.), which took third and fifth place for yield, are also recommended.—E.B.O.

161 Fernando, L. H. **The progressive reduction in the number of rice varieties under issue in Ceylon.** *Trop. Agriculturist* 1959, **115**, No. 3, 183–6. [Dep. Agric., Ceylon]

In Ceylon the number of rice varieties grown has been considerably reduced as a result of breeding and the use of fertilizers. The recommended rice varieties are now 14 (listed). Of these, H-4 is satisfactory as a 4-month variety ; those of a

horter, or longer, vegetative period are not entirely satisfactory.—E.B.O.

162 Fernando, L. H. and Weeraratne, H. **High yielding varieties of rice resistant to blast [*Piricularia oryzae*, in Ceylon].** *Trop. Agriculturist* 1959, **115**, No. 3, 179–81, bibl. 1. [Dep. Agric., Ceylon]

163 Jennings, P. R. Gulfrose, una nueva variedad de arroz resistente a la "hoja blanca". [**Gulfrose, a new rice variety resistant to "hoja blanca".**] *Agric. trop., Bogotá* 1960, **16**, No. 3, 167–70, bibl. 1.

In trials in Colombia, Gulfrose yielded well both in the presence and absence of hoja blanca disease, being better than the varieties Zenith, Nato and Bluebonnet 50.—E.B.O.

164 Sircar, S. M. and Biswas, M. **Viability and germination inhibitor of the seed of rice.** *Nature, Lond.* 1960, **187**, No. 4737, 620–1, bibl. 3. [Bot. Dep., Univ. Calcutta]

Since there is loss of viability in some varieties of rice seeds within one year after harvesting, the authors studied (1) the root and shoot growth in solutions leached from seeds of *Oryza sativa* harvested in different years, and (2) the effect of light quality on the percentage of germination of rice seeds. It is concluded that, since there is a large amount of auxin in the embryos of non-viable seeds and a reduction of embryonic root growth in the leachings, there is a close relation between auxin concentration and the formation of a germination inhibitor. Tests of the effects of different wave-lengths of light showed that white light increased percentage germination over that in the dark, the infra-red producing the greatest inhibiting effect.—M.H.

165 Takahashi, N. **Studies on the internal factors of rice seed regulating the germination velocity.** *Sci. Reps Res. Inst. Tohoku (D)* 1960, **11**, No. 1, 1–7, bibl. 7.

166 Bharucha, F. R. and Karnik, C. R. [**Ecological studies of the weed-flora of the rice fields of Bombay and Salsette Islands.**] *J. biol. Sci.* 1960, **3**, No. 1, 30–7, bibl. 10, illus. [Inst. Sci. Bombay (F.R.B.) and M.J. College Jalgaon (G.R.K.)]

167 Jacques-Félix, H. and Chezeau, R. Sols et groupements végétaux de la zone littorale de Guinée dans leurs rapports avec la riziculture. 1. L'Île du Kabak. [**Soils and plant communities of the coastal zone of French Guinea and their relationship with rice cultivation. 1. Kabak Island.**] *Agron. trop., Paris* 1960, **15**, No. 3, 325–41, bibl. 1, illus., English and Spanish summaries.

In Kabak Island, rice is grown on mangrove clearings after rain has brought the content of Cl in the soil down to about 1% ; the adventive species are then *Philoxerus vermiculatus* and *Sesuvium portulacoides*. With 1 – 0·75% Cl, the halophytes present, in addition to the above species, are : *Paspalum vaginatum* and *Bacopa erecta*. With 0·75–0·70% Cl *Fuirena glomerata* and *Eleocharis caribaea* appear ; they represent a turning point to a non-halophilous flora which is present with less than 0·70% Cl. The high salt content of these swampy rice-fields (which is periodically reduced by rain) is not harmful to rice and accounts for the small number of weed species present. [See also *Fld Crop Abstr.* 11 : 556.]—E.B.O.

168 Smith, R. J. **Weed control in rice : a summary of the 1959 studies.** *Rice J.* 1960, **63**, No. 7, 21–3. [Crops Res. Div., U.S. Dep. Agric., Stuttgart]

169 Director of Agriculture, British Guiana. **Weed control in rice fields.** *Rep. Dir. Agric. Brit. Guiana 1959*, British Guiana, [n.d.], 28–9.

Fimbristylis miliacea in rice was controlled by applying 1·5 pints of 2,4-D (amine salt)/ac to infested areas about 5 weeks after germination. MCPB applied at 1 lb/ac when rice was 3 weeks old gave satisfactory weed control. Dinoseb at 0·5 lb a.i./ac applied 3 weeks after germination of the rice controlled *Sphenochlea zeylanica*.—S.M.J.

170 Chiapparini, L. and Corbetta, G. Nuovi dati sperimentali sul diserbo chimico della risaia. [**New experimental data on the chemical weeding of rice-fields.**] *Riso* 1960, **9**, No. 4, 10–12, bibl. 2, illus. [Sta. Sper. Risicolt., Vercelli, Italy]

Many trials were carried out in 1958–9 to test MCPP for the control of weeds of rice in N. Italy. The main conclusions were : (a) the best time for treatment is immediately before tillering when there is the least chance of damaging the rice plants ; (b) the rate of herbicide should be 3–7 l/ha applied in water at 350–450 l/ha ; (c) the water level in the field should be lowered before treatment so that only the upper portion of the weeds is uncovered, and should be raised 24 hr later ; (d) this treatment controls *Scirpus maritimus*, *S. mucronatus*, *Heleocharis ovata* and *Alisma plantago*, while *Panicum crus-galli* and *Butomus umbellatus* are resistant.—E.B.O.

171 Marshall, W. A. B. and others. **The post-emergence use of herbicides for the control of weeds in rice in Trinidad.** *Emp. J. exp. Agric.* 1960, **28**, No. 111, 244–54, bibl. 11. [Imp. Coll. Trop. Agric., Trinidad, W.I.]

Fimbristylis miliacea, *Sphenoclea zeylanica* and *Jussiaea* spp. are the most important weeds of swamp rice in Trinidad. *F. miliacea* was controlled, without damage to the rice, by applying 0·75 lb Na 2,4-D or 0·75 lb MCPA/ac at the time of rapid tillering. *S. zeylanica* was controlled by applying 0·75 lb ammonium dinoseb/ac, which stimulated the growth of the rice even in the absence of weeds. A mixture of 0·75 lb MCPA + 0·75 lb dinoseb/ac could be used safely at the time of rapid tillering to obtain simultaneous control of all 3 weeds. It was recommended that in transplanted rice 0·75–1 lb Na 2,4-D or Na MCPA/ac should be used to control *F. miliacea* but it is suggested that *S. zeylanica* and *Jussiaea* spp. are best removed by hand. F. s. —S.M.J.

172 González, F. J. Represión de la maleza *Echinochloa colonum* (L.) Link (liendre de puerco) en arrozales. [**Control of the weed *Echinochloa colonum* in rice-fields (in Colombia).**] *Acta agron., Palmira* 1959, **9**, No. 3–4, 203–25, bibl. 20, illus., English summary.

Information, including a botanical description and vernacular names in many languages, is given on *Echinochloa colonum*, a noxious weed of rice in the Cauca Valley and the departments of Tolima and Huila. In herbicide trials in 1958, TCA was better than other chemicals tested and gave satisfactory control. 9·4 kg/ha, which was as effective as 14 kg/ha, is recommended on economic grounds. TCA should be sprayed more than 20 days before rice is sown, on land which has been well watered (but not flooded) to encourage the germination of weed seeds, so that the seedlings can be treated.—E.B.O.

173 Department of Agriculture, New South Wales. **Control of barnyard grass in rice.** *Rep. Dep. Agric. N.S.W. 1959*, 1959, 43.

At Yanco Experiment Farm pre-emergence sprays of TCA and CDAA applied at 6 lb/ac gave good control of barnyard grass (*Echinochloa* spp.) in rice. Post-emergence applications were less effective. CDAA gave slightly better control than TCA, but was more expensive.—S.M.J.

174 Director of Agriculture, British Guiana. **Red rice and its control.** *Rep. Dir. Agric. Brit. Guiana 1959* British Guiana, [n.d.], 31–2.

The incidence of red rice was much higher in areas where dry cultivation rather than wet cultivation was practised. During 1959 it was demonstrated at the Central Agricultural Station that a light wet harrowing following dry cultivation and the subsequent retention of the water in the field for a few days resulted in almost complete suppression of the red rice. 2,4-D applied pre-emergence at more than 4 lb/ac considerably reduced the stand of red rice.—S.M.J.

175 Director of Agriculture, British Guiana. **Control of drop-seed.** *Rep. Dir. Agric. Brit. Guiana 1959*, British Guiana, [n.d.], p. 29.

2,4-D applied at 1, 3, 6 and 9 lb/ac prior to germination of " drop-seed " rice [seed dropped during harvesting] resulted in mortalities of 70, 80, 94 and 100% respectively. A rate of 4 lb/ac gave reasonably good control.—S.M.J.

176 Ciferri, R. Le associazioni di alghe filamentose delle risaie pavesi e la loro evoluzione. [**The associations of filamentous algae (scum) in the rice fields of Pavia province (Italy) and their succession.**] *Riso* 1960, **9**, No. 8, 6–9.

177 Marks, G. C. and Peiris, J. W. L. **Studies on the control of paddy blast caused by *Piricularia oryzae* (Bri et Cav.). 2. A technique of screening fungicides.** *Trop. Agriculturist* 1959, **115**, No. 2, 145–55, bibl. 2.

In field trials to test fungicides for the control of paddy blast, the dusts phenyl mercuric acetate and phenyl mercuric para toluene sulphonanilide were the most effective ; of the liquid preparations, phenyl mercuric dinaphthyl methane disulphonate, phenyl mercuric acetate and phenyl mercuric para toluene sulphonanilide were effective. At the tillering stage the phenyl dust preparations were toxic to many indica varieties, while the japonica varieties tested were resistant. The wettable phenyl preparations were less toxic. The ethyl preparations were non-toxic. F. s.—E.B.O.

178 Misato, T. and others. **Antibiotics as protectant fungicides against rice blast. 2. The therapeutic action of blasticidin S.** [Japanese] *Ann. phytopath. Soc. Japan* 1959, **24**, No. 5, 302–6, bibl. 6, English summary. [Nat. Inst. Agric. Sci., Nishigahara, Tokyo]

The germination of spores of *Piricularia oryzae* was completely prevented when treated with 1 μg/ml of blasticidin S and of mercuric acetate. The former was more effective than the latter against mycelial growth. F. Eng. s.—D.B.

179 Director of Agriculture, British Guiana. **Insect pests and diseases [of rice].** *Rep. Dir. Agric. Brit. Guiana 1959* British Guiana, [n.d.], 32.

Blast (*Piricularia oryzae*) was controlled by 2 or 3 applications of verdasan, an organo-mercury fungicide, at rates of 2 lb in 20 gal applied at 8–10 gal/ac. *Solubea poecila* was controlled by dusting with agrocide 7 (2·6% γ-BHC). In 1959 *Laphygma frugiperda* attacking maturing plants of rice in the field was effectively controlled by spraying with dieldrin or chlordane (rates not given).

The principal rice var. grown in British Guiana, No. 79, was resistant to hoja blanca. The var. D.110 was susceptible.—S.M.J.

180 DAS, T. M. and MUKHERJEE, I. **Studies on the effect of light on growth of seedlings. 1. Effect of periodicity of light on elongation of shoot and root in rice seedlings.** *Indian J. Pl. Physiol.* 1959, **2**, No. 2, 145–52, bibl. 9, [Dep. Agric., Univ. Calcutta]

181 HSUEH, Y. L. and others. **The growth response of rice seedlings to seed-treatment with $NaHCO_3$ as influenced by concentration, temperature and the physiological state of the seeds.** [Chinese] *Acta Agric. sinica* 1960, **11**, No. 1, 48–56, bibl. 19, English summary. [Lab. Pl. Physiol., Fu Tan Univ., China]

Seed treatment with solutions of $NaHCO_3$ influenced root growth of rice seedlings more than top growth. The most effective concentration and temperature were 0·5% and 30°C. The higher the temperature (within 20–35°C) of $NaHCO_3$ solution the lower was the concentration of solution required to produce growth response. Response to treatment declined if applied after 7 April. F. Eng. S.—D.B.

182 KAUFMAN, P. B. **[Development of the shoot of *Oryza sativa* L.—3. Early stages in histogenesis of the stem and ontogeny of the adventitious root.]** *Phytomorphology* 1959, **9**, No. 4, 382–404, bibl. 41, illus. [Dep. Bot., Univ. Michigan, Ann Arbor, U.S.A.]

183 ACADEMIA SINICA. **Studies in the differentiation of the shoot apex of rice. 1. Varietal differences.** [Chinese] *Acta bot. sinica* 1960, **9**, No. 1, 113–21, bibl. 12, illus., English summary. [Lab. Exp. Pl. Morphol., Inst. Bot., Academia Sinica]

The development of the [fertile] shoot of rice is morphogenetically similar to that of millets, in which the inflorescence is a panicle. Among rice varieties there are no great morphological differences in differentiation but there are considerable differences in the rate of development. In consequence, the early-maturing varieties (which have a rapid rate of development) have smaller panicles and fewer grains than late-maturing varieties. Early transplanting of early varieties, by helping to prolong the vegetative stage, tends to increase the size of the panicle. Application of fertilizer before primordia appear may increase the number of branch primordia, but if applied during differentiation of the floral organs the rate of development would be increased resulting in smaller panicles. F. Eng. S.—D.B.

184 YAMAZAKI, K. **Studies on the morphogenesis of crop plants under different growing conditions. 2. The formation of lateral buds in rice and wheat plants.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 262–5, bibl. 9, illus., English summary. [Fac. Agric., Univ. Tokyo]

185 KAI-CHÜ, Y. and others. **A study on the tillers of rice (the third report).** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 5, 398–430, English summary.

186 HIRANO, T. and SHIMADA, H. **Effects of controlling tiller emergence on the growth, chemical components and yield of rice plants transplanted in different seasons.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 271–4, bibl. 7, English summary. [Tohoku Agric. Exp. Sta.]

Transplanting rice earlier than normal caused an increase in tillering and hence there were more panicles per unit area. Highest grain yields were obtained by transplanting early and controlling the number of tillers. Compared with rice transplanted late or at the normal time, the leaf sheaths of early transplanted rice (with tiller number controlled) contained higher percentages of starch and sugars, and the carbohydrates were in a form readily translocated to the ears. F. Eng. S.—D.B.

187 SAHA, B. **Relative lengths of leaf sheath and blade with reference to the developmental stages of the rice plant.** *Nature, Lond.* 1960, **187**, No. 4733, 259–60, bibl. 2. [Jute Agric. Res. Inst., Barrackpore, 24, Parganas, West Bengal]

188 NAGATO, K. and EBATA, M. **Effects of temperature in the ripening periods upon the development and qualities of lowland rice kernels.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 275–8, bibl. 12, illus., English summary. [Nagoya Univ.]

A high night temperature (30°C) caused an acceleration in development of rice grains and in maturation. When so treated during early stages of grain development, many chalky grains were observed about 10 days after flowering. This was attributed to an increase in the storage of nutrients and aleurone in the central part of the grain ; in the outer layer there was a deficiency of nutrients under high night temperature. F. Eng. S.—D.B.

189 CAMPOS, Filomena F. and ESPIRITU, Lucila G. **Correlation studies of the endosperm and embryo size of the Philippine recommended rice varieties.** *Philipp. Agriculturist* 1959, **43**, No. 7, 478–9.

The average lengths of endosperm and embryo tissue are given for grain of 7 upland and 7 lowland rice varieties. The 2 measurements were significantly correlated in the upland variety Kinandang Puti and the lowland varieties Intan, Tjeremas and B-E-3 only.—R.B.

190 Hasegawa, S. and others. **Comparison of water absorption by paddy- and upland-rice under upland field conditions.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 279–80, bibl. 4, English summary. [Kanto-Tosan Agric. Exp. Sta.]

From these experiments it was concluded that swamp rice on upland fields requires irrigation at shorter intervals and with greater amounts of water than does upland rice, especially during the period following heading. F. Eng. s.—D.B.

191 Urano, K. and others. **Studies on the irrigation and the deep ploughing. 2. The nutriments absorption of upland rice and soybean, and the changes in soil properties.**[Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 289–90, bibl. 7, English summary. [Kikyogahara Branch, Nagano Agric. Exp. Sta.]

192 Academia Sinica. **Studies in the differentiation of the shoot apex of rice. 2. The effect of the saline-alkali water irrigation upon the differentiation and the development of the shoot apex in rice.** [Chinese] *Acta bot. sinica* 1960, **9**, No. 1, 122–6, bibl. 3, illus. English summary. [Lab. Exp. Pl. Morph., Inst. Bot., Acad. Sinica]

The earlier the stage of development, the lower was the tolerance of rice to saline irrigation water. For temporary irrigation, the salt concentration should not exceed 0·1% if applied at renewal of growth in early spring, 0·2% at tillering, and 0·4% at shooting stage. These concentrations would not harm the development of the shoot apex. For long-period irrigation, the salt concentration should not exceed 0·1%. F. Eng. s.—D.B.

193 Pearson, G. A. and Bernstein, L. **Salinity effects at several growth stages of rice.** *Agron. J.* 1959, **51**, No. 11, 654–7, bibl. 8. [U.S. Salinity Lab., Soil and Water Conserv. Res. Div., U.S. Dep. Agric., Riverside, California]

Caloro rice was grown under glasshouse condition with careful control of the percolation rate and conductivity of the irrigation water. Twelve salinity treatments were used ; 3 were analogous to planting seedlings into saline fields which retained constant salinity levels. In the rest salinity increased as the growing period progressed. Changes in salinity were made at early and late tillering and at heading. Measurements were made of over-all height of plants, number and length of panicles and total dry-weight yield of tops. Grain yield was very poor. Increasing levels of salinity maintained at constant values for the 21-week period of differential treatment caused a progressive reduction in yield of tops. In general, salinity at early stages of growth reduced yield more than salinity at later stages, but most of the yield differences were not significant. The maximum salinity levels associated with reasonably good yields were : at early tillering, conductivity of soil solution < 3 millimhos ; at late tillering, 4 millimhos ; at heading, 8 millimhos.—A.M.H.

194 Ehrencron, V. K. R. Onderzoek naar de zouttolerantie van rijst. [**Investigation on salt tolerance in rice.**] *Jaarversl. LandbProefst. Suriname 1959* 1960, 21–2.

In pot trials, rice was capable of maturing grain in soil containing up to 304 mg Cl/100 g dry soil. The percentage of grain which was mouldy at harvest increased with increasing soil salinity.—R.B.

195 Sircar, S. M. and Mukherjee, R. K. **Studies on the physiology of rice. 14. Nitrogen metabolism in relation to [N] deficiency and leaf age.** *Indian J. Pl. Physiol.* 1959, **2**, No. 2, 104–15. [Dep. Bot. Univ. Coll. Sci., Calcutta-19]

196 Hasegawa, G. **Studies on leaf analysis. 10. Seasonal changes of mineral elements in successive leaves, internodes and ears on the main culm of rice plant, and their accumulation and translocation.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 259–61, bibl. 21, English summary. [Hyogo Univ. Agric.]

197 Gong-Mou, S. **Translocation and distribution of assimilates from the leaves of rice plant during its various developing periods. Experiments with radioactive carbon (C^{14}).** [Chinese] *Acta Agric. sinica* 1960, **11**, No. 1, 30–40, bibl. 30, English summary. [Inst. Pl. Physiol., Academia Sinica, Shanghai]

The technique by which the direction and rate of translocation of photosynthetic products was studied in rice plants (using $^{14}CO_2$) is described. Plants were examined at 5 growth stages, and at each stage the youngest, 2nd youngest and 4th leaves were fed $^{14}CO_2$. At each growth stage there were one or more centres of active growth or storage to which the bulk of the photosynthetic products was transferred. At all stages of growth, translocation of photosynthetic products was most active from the 2nd leaf. The lower leaves (represented by the 4th leaf) provided assimilatory products to the lower internodes and the root. The activity of the lower leaves was greatly reduced after ear development. Only at the tillering stage

and under favourable light conditions did the main stem supply new tillers with assimilatory products. After this stage the new tillers were physiologically independent. F. Eng. s.—D.B.

198 Fernandes, S. J. G. Aminoácidos indispensáveis em algumas formas cultivadas de arroz. [**Indispensable amino acids in some cultivated rice varieties.**] *Rev. agron., Lisboa* 1958, **41**, 49–54, bibl. 24, English summary. [Lab. Quím. Agríc. Rebelo da Silva, Portugal] [Received Sept., 1960]

The results are given from the determinations of 9 essential amino acids in 8 cultivated rice varieties. These amino acids were 36·71%, on average, of the total protein,and the varieties Marchetti and Chinês had the highest values, 37·52% and 37·50%, respectively. The greatest differences among varieties were found in the content of methionine and of lysine (expressed as percentages of the total protein).—E.B.O.

199 Borasio, L. Prospetto delle esigenze nutritive e fertilizzanti della pianta del riso.[**The nutritive and manurial requirements of the rice plant.**] *Riso* 1960, **9**, No. 6, 10–11, illus. [Sta. Sper. Risicolt, Vercelli, Italy]

This article gives the percentages of the various chemical elements present in paddy and straw, the quantities of chemical elements taken up by a rice crop, and the quantities of fertilizers it requires.—E.B.O.

200 Ubels, E. Rijst. Proeven met N, P en K in district Suriname. [**Rice. N, P and K trials in Suriname district.**] *Jaarversl. Landb-Proefst. Suriname 1959* 1960, 30–2.

Rice, var. Dima, grown in 14 trials on 5 soil types, was given (a) 200 kg $(NH_4)_2SO_4$ (20%N) in 2 equal applications 3 and 6 weeks after sowing, (b) 200 kg phosphate (30% P_2O_5) at sowing, (c) treatments (a) and (b) combined, (d) as (c) plus 100 kg K_2SO_4 (50%K_2O) at sowing. Grain yields at 14% moisture were : (a) 3357 kg/ha, (b) 3840 kg/ha, (c) 4319 kg/ha, (d) 4253 kg/ha, unmanured control 3372 kg/ha. Yields from treatment (a) were significantly lower than those from (b), (c) and (d), while treatment (c) gave significantly higher yields than treatment (b). Yields of Dima rice in 1959 from plots receiving 100 and 200 kg 30% P_2O_5 in 1958 were 4 and 11%, respectively, higher than those from plots not given P in 1958 which yielded 4121 kg grain/ha in 1959.—R.B.

201 Amer, F. **Evaluation of dry-subsurface and wet-surface ammonium sulfate application for rice.** *Plant and Soil* 1960, **13**, No. 1, 47–54, bibl. 7. [Univ. Alexandria, Egypt]

Lowland rice was grown with 0, 10, 20, 30 or 40 kg N/feddan (1 feddan = 4200·8 sq. m) applied as ammonium sulphate (a) ploughed in before flooding, (b) as 2 equal applications broadcast at tillering and again prior to earing. Where 10 and 40 kg N/feddan were applied, recovery of applied N by the crop was (a) 84·1 and 52·8%, respectively, (b) 49·4 and 38·2%, respectively. Treatment (a) gave significantly higher grain yields than treatment (b). The N content of the grain (1·19%) was not significantly affected by treatment. F. s.—R.B.

202 Langfield, E. C. B. **The effect of the placement of ammonium sulphate on the yield of rice in Northern Australia.** *Trop. Sci.* 1959, **1**, No. 4, 286–9, bibl. 7. [Kimberley Res. Sta., W. Aust.]

During investigations at the Kimberley Research Station, a significant increase in the grain yield of the *indica* and *japonica* varieties of rice was obtained by the placement of $(NH_4)_2SO_4$ at 3 in., compared with shallow or surface placement. Deep placement resulted in an increase in both panicle weight and number, but also delayed maturity, increased plant height and, with the *indica* variety, caused weakened straw. F. s.—S.M.J.

203 De Rege, F. Proposta di un metodo di valutazione del grado di conservazione del riso e dei suoi sottoprodotti. [**A proposed method for evaluating the degree of conservation of rice and its by-products.**] *Ann. Sta. sper. Risicolt., Vercelli 1955* 1959, **3**, 79–83, English and French summaries.

The degree of conservation of hulled rice and rice by-products is expressed on a percentage basis according to the formula : Degree of conservation

$$= 100.\frac{85-(G-5)}{85},$$

where G is the percentage value of fermented fats, 5 the minimum percentage found normally in by-products immediately after extraction, and 85 is the maximum percentage of fermented fats found under the worst storage conditions. From this formula the following scale of degrees of conservation has been derived : 100–88% very good, 88–71% good, 71–53% medium, 53–35% bad and less than 35% very bad.—E.B.O.

QUINOA

204 Velazquez, G. Dora. Análisis cromatográfico de aminoácidos de variedades de quinua. [**Chromatographical analysis of amino acids in quinoa varieties.**] *Agronomía, Lima* 1959, **26**, No. 3, 257–65, bibl. 23. [Esta. Exp. Agríc., La Molina, Peru]

Of 6 varieties of quinoa (*Chenopodium quinoa*) examined, Blanca de Huancayo had the highest content of total proteins, 14%. The varieties

Blanca de Puno and Blanca de Jauja had the highest content of lysine, methionine and tryptophan.—E.B.O.

SETARIA VIRIDIS

205 Mirošnikov, V. N. **[Duration of the photophase in some varieties of *Setaria viridis*.]** [Russian] *Agrobiologija (Agrobiology, Moscow)* 1960, No. 3 (123), 443–6. [Orenburg Agric. Inst.]

The two Chinese varieties Vorsistaja and Bambukovyĭ koren' ripen late, and in the variety Kogot'drakon panicles are not formed because in these types the photophase is prolonged and they develop slowly in the relatively long day of the Orenburg Province [now Čkalov, 52°N., 55°E.]. —M.H.

GENERAL

See also Abs. 418, 419, 420.

206 Anderson, C. H. and others. **Fertilizer studies with wheat, oats and barley grown on grey wooded and black soils in the Peace River region of Northwestern Canada.** *Canad. J. Soil Sci.* 1960, **40**, No. 2, 199–206, bibl. 6. [Canada Dep. Agric., Beaverlodge, Alberta]

Saunders wheat, Olli barley and Beaver oats were grown during 1951–5 on 4 soils which had been fallowed or cropped with cereals during the year before sowing. Fertilizer treatments were : 10 or 19 lb N/ac ; 6 lb P_2O_5/ac with or without 5 lb N/ac ; 12 lb P_2O_5/ac plus 0, 3 or 10 lb N/ac ; 24 lb P_2O_5/ac plus 0, 6 or 19 lb N/ac or 8 lb N plus 8 lb K_2O/ac. Increases in yield due to manuring were greater after fallow than after cereals. Where cereals followed fallow, barley responded best to manuring, while after cereals barley and oats responded best. N and P_2O_5 were equally effective in increasing yields on 3 grey wooded soils, while P_2O_5 increased yields to a greater extent than N on black soil.—R.B.

207 Hilli, A. Kotona viljellyn kevätviljan siemenkelpoisuudesta. **[The value of home-grown summer cereals for sowing.]** *Maataloust. Aikakausk.* 1960, **32**, No. 1, 8–16. [Govt Seed Control Sta., Helsinki]

The following are some of the findings from a study of 487 seed samples of oats, 227 of summer wheat and 141 of multi-rowed barley, representative of the general level of seed grown in Finland. Summer wheat and barley exhibited the greatest varietal purity, but with the oat samples, mixtures of varieties and faults in varietal descriptions were found. Weed seed adulteration was greatest in the barley, admixture of other crop seeds greatest in the oats. Of the oat grains, an average of 7·5% was deglumed. The principal factors reducing germination capacity were frost damage, mould and injuries produced in threshing and drying. F. Ger. s.—G.M.R.

208 Wallace, H. A. H. **Factors affecting subsequent germination of cereal seeds sown in soils of subgermination moisture content.** *Canad. J. Bot.* 1960, **38**, No. 3, 287–306, bibl. 22. [Canada Dep. Agric., Plant Path. Lab., Winnipeg, Manitoba]

209 Pfeiffer, R. K. **Some aspects of the use of 2,3,6-TBA/MCPA mixtures for selective weed control in cereals.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 54–60, bibl. 3. [Fisons Pest Control Ltd., Chesterford Park]

The results are presented of 42 yield experiments carried out in 1956–8 on wheat, barley and oats treated with a mixture of MCPA and 2,3,6-TBA (Fisons 18-15). All cereal crops except spring wheat were unaffected if sprayed between tillering and the beginning of the jointing stage. The safe period for spring wheat appeared to be shorter. Factors affecting the performance of the TBA/MCPA mixture are listed. F. s.—A.M.H.

210 Elliott, C. S. **The relative susceptibility of cereal varieties to growth regulator herbicides. Some preliminary investigations with MCPA and 2,4-D (also CMPP and 2,3,6-TBA).** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 61–6. [Nat. Inst. Agric. Bot., Cambridge]

Experiments were carried out in 1955–8 to investigate the effects of heavy doses of MCPA and 2,4-D applied at an early growth stage on different varieties of spring wheats, oats and barleys. Among spring wheats tested, Bersee showed least deformity, followed by Peko and Svenno; Fylgia, Fylgia II and Atle were severely damaged. In 1955 and '56 the spring oats Malwyn, Milford, Primus II and Clinton were more than usually susceptible to MCPA damage, although damage to all varieties was slight in 1956. Flamande-Desprez introduced in 1956 was the most susceptible to MCPA. Orion II was the least damaged. Carlsberg and Maythorpe were the spring barley varieties most susceptible to damage by MCPA and Carlsberg the most susceptible to 2,4-D. The older English barleys, Spratt Archer, Plumage-Archer and Earl were less susceptible than more recently introduced Scandinavian varieties. The evidence suggested that differences in susceptibility were not due simply to different stages of development having been reached at the time of spraying.—A.M.H.

211 Marshall, Gillian M. **The incidence of certain seed-borne diseases in commercial seed samples. 2. Ergot, *Claviceps purpurea* (Fr.) Tul., in cereals.** *Ann. appl. Biol.* 1960, **48**, No. 1, 19–26, bibl. 6. [Off. Seed Test. Sta., Huntingdon Road, Cambridge]

The incidence of ergot in commercial cereal seed samples submitted to the above Station from 1918 to 1957 has been examined. Rye samples were more frequently contaminated than wheat or barley and no cereal ergots were recorded in oats. A relatively high proportion of ergot-contaminated rye samples occurred every 8–10 years. This appeared to be associated with high relative humidity and low maximum temperature during June. Similar trends were found for wheat and barley. No varietal differences in susceptibility to ergot contamination were found for rye or barley, but there was some evidence that spring wheat varieties were more frequently contaminated than winter ones. [See also *Fld Crop Abstr.* 13 : 67.] F. s. —M.H.

212 FAO. Rapport de la troisième réunion FAO sur la lutte contre la punaise des céréales, tenue à Meknès, Maroc, du 21 au 26 Septembre 1959. [**Report of the 3rd FAO meeting on the control of sunn pest of cereals, held at Meknès, Morocco, 21-26 Sept. 1959.**] *Meet. Rep. 1959/10 FAO* 1959, pp. 33.

This publication gives separate reports presented by delegates from Morocco and countries of the Middle East on the progress achieved in the control of sunn pest (mainly *Eurygaster* spp. and *Aelia* spp.), and also a general programme for the co-ordination of research. A Centre for Documentation and Information on sunn pest has been established at the Institut Pasteur in Paris. Recommendations are made concerning further research which should consider resistant cereal varieties and biological control. [See also *Fld Crop Abstr.* 12 : 10.]—E.B.O.

213 Aufhammer, G. and others. Versuche zur Prüfung der Dürreresistenz von Sommergerste. [**Testing drought resistance in spring cereals.**] *Z. Acker- u. PflBau* 1960, **110**, No. 2, 117–34, bibl. 22, English summary. [Inst. Acker- u. PflBau, Techn. Hochsch. München-Weihenstephan, W. Germany]

Several species and varieties of spring wheat and spring barley were grown in pots, tanks and in the field and were tested for drought resistance. Adequate soil volume for the roots was an essential condition for this test. The varieties remained in the same order of drought resistance whether the drought conditions were continuous or interrupted (the latter simulating the more usual climatic condition in Germany). The grain yield obtained under drought conditions compared with the yield under normal conditions remained the best criterion of drought resistance. Of the resistant species, the adaptation to drought was expressed either in many poorly developed grains per ear, or in few well developed grains per ear. The root/shoot ratio of young plants could not be used as a direct measure of drought resistance.—D.B.

214 Barannikov, P. V. [**Morphological indicators of the completion of developmental stages in regard to phasic development and frost resistance in winter cereals.**] [Russian] *Agrobiologija* (*Agrobiology, Moscow*) 1960, No. 3 (123), 420–6. [Kuban Agric. Inst.]

The data concern the appearance and elongation of the growing points of the stems when the crops are sown at different dates (26 Aug. – 25 Oct.).—M.H.

215 Gesslein, S. Stråsädens Mognadsförlopp och Skördemetoderna. **Ripening process of cereals and harvesting methods.** *Växtodling, Uppsala* 1959, **13**, pp. 164, bibl. 194, illus., English summary.

This thesis is based on work done with 66 cereal varieties in 1949/53. After observations on emergence, heading and flowering, the specific studies began at the milk-ripeness stage. The point of time was established for different stages of ripeness, viz : milk-ripeness, yellow-ripeness, underripeness, full-ripeness and combine-ripeness. The external and internal, or physiological, changes which the kernel undergoes during the course of ripening were followed. The author introduces the concept of " the tenability of the stand at overripeness " to express the collective effect of lodging and stem- and ear-breakage in the over-ripe stage when cereals are often subject to severe external strains. Large differences were found in tenability between different cereals and their varieties. The determination of earliness in a variety should be made at several stages of ripeness, particularly at the combine-ripeness stage. F. Eng. s.—A.G.G.H.

216 Nederlands Graan-Centrum, Wageningen. Tienjarenplan voor graanonderzoek. Verslag over het vijfde jaar, 1958. [**Netherlands Grain Centre. Ten-year plan for cereal research. Report on the fifth year, 1958.**] 1959, pp. 128, illus.

The following papers [in Dutch] are noted : (1) Report on the hybridization programme and study of resistance to climatic conditions. By G. Dantuma and J. Mesdag, pp. 15–24. (2) Report on 1958 trials on seed dormancy and sprouting. By B. Belderok, pp. 39–51. [See *Abs.* 31.] (3) Comparative trial with 10 rye strains regarding the occurrence of a harmful constituent in the grain. By G. van Wieringen, pp. 55–8. (4) Report on experiments connected with fundamental research on cereals. By W. H. van Dobben, pp. 59–80. (5) Research on grain drying and storage in 1958. By J. Kreyger and P. J. J. Philipsen, pp. 85–98. (6) The effect of crop rotations on the development of oat root eelworm [*Heterodera major*]. By S. Broekhuizen, pp. 125–6.—R.B.

LEGUMES

SOYABEANS

See also Abs. 95, 191, 451.

217 Director of the Highveld Region, Union of South Africa. **Germination of soybeans.** *Rep. Dir. Highveld Reg. S. Afr. 1956-7* 1959, 10.

Where the soil was inclined to puddle and to form a crust after rains, the best germination of soyabean seed was obtained by sowing at 120–150 lb/morgen [= 2·117 ac] at a depth of 2 in. Sowing at a depth of 3 in. or more gave satisfactory results only when warm, dry weather followed sowing.—S.M.J.

218 Smith, P. E. **New soybean varieties for Ohio.** *Soybean Dig.* 1960, **20,** No. 9, 17. [Ohio Agric. Exp. Sta.]

Information is given on the soyabean varieties Henry, Madison and Ross, which are resistant to root rot (*Phytophthora* sp.).—E.B.O.

219 Howell, R. W. and others. **Respiration of soybean seeds as related to weathering losses during ripening.** *Agron. J.* 1959, **51,** No. 11, 677–9, bibl. 16. [U.S. Regional Soybean Lab., Urbana, Illinois]

The effects of degree of hydration and temperature on respiration rates of ripening soyabean seeds were determined. The respiration rate was closely correlated with moisture content, but temperature variations between 21 and 37°C affected the rate less than in tissues such as stems and roots. Rates observed at 21, 29 and 37°C would result in the consumption of enough hexose to cause weight losses of 0·03, 0·04 and 0·052% per hr, respectively. The temperature coefficient over this range suggested that respiration was limited by the rate of diffusion of oxygen into the tissue. Natural rain in the field or simulated rain on intact detached pods in the laboratory increased the moisture content of the seed, but did not leach out appreciable quantities of sugar. Only the leachate from seeds contained a substantial quantity of sugar. It was concluded that losses in sugar and seed weight associated with wet, humid weather arise from the delay in seed dehydration and resultant prolongation of rapid respiration rates. F. s.—A.M.H.

220 Haghiri, F. **Influence of macro-nutrient balance in sand culture on the vegetative growth and composition of nodulated and non-nodulated soybeans.** *Diss. Abstr.* 1960, **20,** No. 8, 3003. [Univ. Nebraska, Lincoln]

The results are given of 5 sand-culture experiments using closely related nodulating and non-nodulating soyabean strains grown in Hoagland and Arnon nutrient solutions in which the levels of P, S, Ca, Mg and K were varied in relation to those of the other macro-nutrient elements. There was a positive correlation between the yield of soyabean tops and roots and the P, Ca, Mg and K concentrations in the nutrient media. The results of these studies failed to indicate clearly why soyabeans do not respond as readily as many other crop plants to applications of deficient nutrient elements. There was some evidence that the balance of macro-nutrient elements was a factor, but little to show that nodulation was.—P.J.B.

221 Brown, D. M. **Soybean ecology. 1. Development-temperature relationships from controlled environment studies.** *Agron. J.* 1960, **52,** No. 9, 493–6, bibl. 15. [Ontario Res. Fdn, Toronto, Canada]

The average rate of development showed a curvilinear relationship to temperature. The threshold or base occurred near 50°F and the optimum near 86°F. The curve was parabolic for the range of temperatures used in this study. F. s. —A.G.G.H.

222 Brown, D. M. and Chapman, L. J. **Soybean ecology. 2. Development-temperature-moisture relationships from field studies.** *Agron. J.* 1960, **52,** No. 9, 496–9, bibl. 6. [Ontario Res. Fdn, Toronto, Canada]

Average rate of development per degree F in the preflowering period was nearly the same as the rate on the previously derived development curve at the mean of the average temperatures encountered in the field. Lower rates than those on the development curve occurred in the post-flowering period. Available moisture, as well as temperature, was correlated with development rate in the flowering period. F. s.—A.G.G.H.

GROUNDNUTS

223 Sardone, L. T. **The groundnut industry of Queensland.** *World Crops* 1960, **12,** No. 9, 351–4, illus.

224 ter Horst, K. Het optimale plantverband voor pinda van het ras Matjan. **The optimal spacing for Spanish-type peanuts.** *Surinaam. Landb.* 1959, **7,** Nos. 5–6, 121–8, bibl. 9, English summary. [LandbProefst. Suriname, Paramaribo]

Yield data from 4 experiments on spacing of groundnuts, var. Matjan, are given. From analysis of these data and those of a fifth experiment [*Fld Crop Abstr.* 12 : 1309] it was concluded that yields from plants spaced 30 cm × 30 cm apart (1009

plants/are, 40,834 plants/ac) were nearly as high as from those spaced 20 cm × 30 cm apart (1667 plants/are, 67,463 plants/ac), 15 × 30 cm apart (2221 plants/are, 89,884 plants/ac), or 10 cm × 30 cm apart (3330 plants/are, 134,765 plants/ac). Plants tended to lodge at the highest density. Plants spaced 40 cm × 30 cm apart (833 plants/are, 33,712 plants/ac) or 50 cm × 30 cm apart (667 plants/are, 26,993 plants/ac) yielded significantly less. Shelling percentage and weight per 100 seeds improved slightly with closer spacing. The 30 cm × 30 cm spacing was the most profitable F. Eng. s.—R.B.

225 Director of the Highveld Region, Union of South Africa. **Effect of spacing and seed size on pod formation [of groundnuts].** *Rep. Dir. Highveld Reg. S. Afr. 1956-7* 1959, 9.

Experiments with Virginia Bunch groundnuts during 2 yr showed that sowing large seeds 9 and 12 in. apart in rows 30 and 36 in. apart increased the percentage of large pods and the strength of the peduncles, but highest yields were obtained from large seeds spaced from 2–6 in. apart in the rows.—S.M.J.

226 Director of the Highveld Region, Union of South Africa. **Weed control in groundnuts.** *Rep. Dir. Highveld Reg. S. Afr. 1956-7* 1959, 12.

The application of 2 lb 2,4-D and up to 2·5 lb MCPA per morgen 3–4 days after planting gave good control of weeds in groundnuts for 3–4 weeks. This eliminated an average of 3 cultivations. A further application, 10 days later, of 1·5 lb MCPB/morgen resulted in almost 100% weed control. The pre-emergence application retarded growth of groundnuts for 14 days in warm weather, but in cold weather rendered the groundnuts more susceptible to attack by disease, particularly *Aspergillus* spp. Post-emergence applications resulted in a significant decrease in yield.—S.M.J.

227 Bedi, K. S. and others. **Control of seed-rot, seedling blight and collar-rot in groundnut.** *Indian Oilseeds J.* 1960, **4**, No. 2, 85–9, bibl. 2. [Govt Agric. Coll., Ludhiana, Punjab]

The disease-causing fungi were species of *Fusarium*, *Aspergillus*, *Rhizoctonia* and *Sclerotium*. Treating groundnut seed, whether damaged or healthy, with agrosan or ceresan resulted in an increased survival of seedlings and a greater seed yield. Ceresan was much more effective than agrosan.—D.B.

228 Green, A. A. **The control of insects infesting groundnuts after harvest in the Gambia : 2. Field trials on the control of the groundnut borer, *Caryedon gonagra* (F.).** *Trop. Sci.* 1960, **2**, No. 1–2, 44–54, bibl. 3, illus. [Pest Infest. Lab., Agric. Res. Coun., Slough]

A comparison was made in field trials of DDT and lindane dusts and dispersible powders for the protection of undecorticated groundnuts from infestation by the groundnut borer, *Caryedon gonagra* (F.). Dusts were slightly more effective than dispersible powders and had practical advantages. Treatment of the surface of heaps of nuts with a single dose of DDT at 400 mg/sq. ft, or fortnightly doses of lindane at 20 mg/sq. ft, gave virtually complete protection against infestation during a storage period of 4 months. Final recommendations were for the use of 0·5% lindane dust, 1 lb/100 sq. ft (about 40 mg lindane/sq. ft) to be applied to the surface of bulk-stored nuts and 6 oz/100-lb bag (about 19 parts per million) to be mixed with nuts intended for seed. F. s.—A.G.G.H.

229 ter Horst, K. Peulvruchten. Pinda : bemesting. [**Pulse crops. Groundnuts : manuring.**] *Jaarversl. LandbProefst. Suriname 1959* 1960, 40–4.

In fertilizer trials, groundnuts were given (a) no fertilizer, or (b) 200 kg 5–10–10 (NPK) and 50 kg $MgSO_4$ monohydrate/ha plus ground calcic limestone (50% CaO) at 0, 500, 1000, 1500, or 2000 kg/ha in 1958. Some plots were given NPK and Mg again in 1959. Yields declined on unlimed plots. The residual effect of lime in increasing yields in 1959 was greater than its effect in 1958. In trials in 1959 at 5 locations, 200 kg 5–10–10 (NPK) plus 50 kg $MgSO_4$ monohydrate/ha increased yields, but not in all trials. Increasing the NPK application to 300, 400 or 500 kg/ha increased yields to an insignificant extent. Ground calcic limestone at 1200 kg/ha slightly increased yields, while ground shells at the same rate gave highly significant yield increases.—R.B.

230 Gillier, P. and Prevot, P. Fumures minerales de l'arachide au Senegal. [**The application of mineral fertilizers to the groundnut in Senegal.**] *Bull. Res. Coun. Israel (D)* 1960, **8**, No. 3–4, 131–50, bibl. 7, illus. [Inst. Rech. Huiles et Oleagineux, Paris]

The results of many trials in different parts of Senegal have shown 4 types of mineral fertilization to be adapted to the different regions of the country. The interpretation of findings was facilitated by means of foliar diagnosis, on the basis of which study the nutritional requirements of the groundnut in Senegal are mapped. For the small doses of fertilizer employed (between 100 and 150 kg/ha), placement as a side-dressing is preferable to broadcasting. A suitable distributor which can be attached to a mechanical sower has been designed. Phosphorus deficiency is very common in Senegal, and comparison is given of the different forms of

phosphate ; the action of sulphate of ammonia and of urea is also compared and the existence of sulphur deficiency is demonstrated. In southern Senegal, over 200 trials of applying mineral fertilizer (NPK) compared with the absence of fertilizer show an increased yield from NPK of over 500 kg groundnuts per ha or an increased productivity of 50%.—G.M.R.

231 Davey, Pauline M. and others. **The effect of insect infestation on the quality of decorticated groundnuts with special reference to storage at high and low humidities.** *Trop. Sci.* 1959, **1**, No. 4, 296–307, bibl. 3. [Pest Infest. Lab., and Trop. Prod. Inst., London]

Caryedon gonagra, *Tribolium castaneum* and *Trogoderma granarium* caused considerable loss in weight and deterioration in the quality of the oil of groundnuts when stored at 30°C and 70% relative humidity. The free-fatty-acid content of kernels previously infested by these insects was not affected by storing at 75% R.H. (provided fungal infections did not develop) or at 48% R.H. It was concluded that, from a practical point of view, the quality of W. African groundnuts could not be improved by storing at low relative humidities. F. s.—S.M.J.

232 Fonseca, J. P. C. da. Alguns aspectos da secagem e armazenamento indígenas do amendoim (mancarra) na Guiné Portuguesa. **[Some aspects of drying and storing groundnuts by Africans in Portuguese Guinea.]** *Garcia de Orta, Lisboa* 1958, **6**, No. 3, 451–5, bibl. 3, illus., English and French summaries. [Received Oct., 1960]

PEAS

See also Abs. 49, 424.

233 Reynolds, J. D. **A guide to weed control in peas.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 143–8, bibl. 12. [Pea Growing Res. Org., Yaxley, Peterborough]

The relative advantages of inter-row cultivation and spraying peas with herbicides are summarized. Recommendations for the use of herbicides under different conditions are tabulated, and practical notes on control measures are given. —A.M.H.

234 Schmidt, T. Ein Beitrag zur Bekämpfung der Brennfleckenkrankheit der Erbse (*Ascochyta pisi* Lib.). **[Towards the control of *A. pisi* Lib. on peas.]** *PflSchBer.* 1960, **24**, 5/7, 91–7, bibl. 5. [Bundesanst. f. Pflanzenschutz, Wien, Austria]

Emergence was considerably increased by treating pea seeds naturally infected with *A. pisi* with formulations of thiram. A formulation of phaltan was the most successful in preventing secondary infection of the shoots ; a copper oxychloride product was the next best. F. Ger. s. —D.B.

235 Heuver, M. De invloed van het wegnemen van bloemknoppen op de opbrengst en het duizendkorrelgewicht van erwten. **Influence of the removal of flower buds on the yield and the thousand kernel weight of peas.** *Tijdschr. PlZiekt.* 1960, **66**, No. 2, 111–19, bibl. 2, English summary. [PlZiektenk. Dienst, Wageningen, Netherlands]

In 3 trials, pea midge (*Contarinia pisi*) damage was simulated by removing flowers from one or more nodes. Removing flowers from 1 and 2 nodes reduced yields by 1 and 7%, respectively, and increased 1000-seed weight by 3·5 and 7%, respectively. In one trial, handling the plants without removing flowers reduced yield by 6%. Removal of flowers was associated with an increase in the number of seeds per pod, the number of pods per node and the 1000-seed weight.—R.B.

236 Danielson, C. E. **Sugar and starch in ripening peas.** *Acta Agric. scand.* 1959, **9**, No. 2, 181–8, bibl. 4. [Findus Res. Lab., Bjuv, Sweden]

Data are given of the fresh weight, dry matter, sugar and starch in the seed of peas (var. Profusion) harvested at different stages of maturity during 1954–6. The concentration of sugar in the water phase of pea seeds remained relatively constant during the greater part of the process of maturation, and then fell rapidly. Starch was synthesized at first slowly and then rapidly. The rapid starch synthesization occurred at an earlier stage than the rapid fall in sugar content. There were considerable differences between the developmental phases in pea seeds between different seasons. Tenderometer values were unreliable as indices of the starch content of the seeds.—P.J.B.

237 Cruickshank, I. A. M. and Perrin, D. R. **Isolation of a phytoalexin from *Pisum sativum* L.** *Nature, Lond.* 1960, **187**, No. 4739, 799–800, bibl. 4. [CSIRO, Canberra, Australia]

The presence of an antifungal compound in pods of *P. sativum* is reported.—M.H.

BEANS

238 Elliott, J. G. **Herbicide tests on field beans.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 126–30, bibl. 4. [A.R.C. Unit of Exp. Agron., Oxford]

Results are reported of 3 experiments on field beans (*Vicia faba*) in 1957 and 1958. As a result of a screening experiment using 6 herbicides, simazin at 0·5, 1·0 and 2·0 lb/ac was applied to the soil surface before emergence of winter and spring

beans and also mixed in the seed bed for winter beans, the crops being kept clean by hand-weeding. In no case was the yield or growth significantly different from that in hand-weeded controls. When plots of spring beans were not hand-weeded, the control gave a reduced yield, but in plots treated with simazin at 2·0 lb/ac control of all weeds was satisfactory and yields were significantly higher than the unweeded control and not significantly different from hand-weeded plots. It was concluded that on an Oxford clay soil simazin had little toxicity to field beans at dosages up to 2 lb/ac. F. S.—A.M.H.

239 Riedel, I. B. M. and Wort, D. A. **The pollination requirement of the field bean (*Vicia faba*).** *Ann. appl. Biol.* 1960, **48**, No. 1, 121–4, bibl. 3. [Bee Dep., Rothamsted Exp. Sta., Harpenden, Herts]

Many of the flowers on field bean plants fail to produce pods even when fully pollinated. When insect pollination is prevented, pod production on the lowest inflorescences, which normally produce most pods, is reduced but a compensatory increase on the upper ones ensures a moderate yield. This change in the distribution of pods may be a useful indication of insufficient pollination. F. S.—M.H.

VETCH

240† Kabakov, I. **[Biology and agronomic practices in spring vetch (*Vicia sativa*) production in the Sverdlovsk Province.]** [Russian] *Sel'hoz. Sibiri* (*Agric. Siberia*) 1960, **5**, No. 7, 18–21.

Vicia sativa is comparatively unexacting in its temperature requirements. The seed germinates at 1–2°C, and seedlings tolerate 4–5°C, but the higher the average daily temperature, the shorter the period between sowing and seedling emergence. With an average daily temperature of 18°C, this period is 8·3 days, and with 9°C, 21 days. Field germination is rarely 100%. Of 314 tests in the Sverdlovsk Province [58°N., 61°E.] germination was 100% in only 11 of the plots, and in 52 germination was below 70%; the average from several years' data was 82–86%, depending on temperature and on the water regime of the soil. The period from seedling growth to the beginning of flowering was, on average, 41–44 days. During this period, vetch requires a total temperature of 424–810°C. Survival of the plants from germination to harvesting time varies between 77 and 90%. Observations covering 10 years in the forest/steppe zone showed that survival was the lowest (27%) in 1952 with an average daily temperature of 19·2°C, precipitation being 170 mm, and highest in 1950 (100%) with average daily temperature 14·3°C and precipitation 310 mm. There is a relationship between rainfall and pod formation; in 1955–6 with rainfall of 116–128 mm the average number of pods per plant was 4·5 but in 1957–8 (rainfall 34–38 mm) the average pod number per plant was 1·6. Data from several years show that flowering lasts (on average) 11–21 days, depending on temperature. The most intensive growth and accumulation of dry matter take place during the period from the beginning of flowering to pod formation. To obtain not less than 15,000 kg/ha [green weight], at least 100 mm precipitation is necessary during the period from germination to the formation of the first pod. When grown for fodder a total temperature of 922°C is required during the vegetative period. Harvesting vetch for green feed and hay should be at pod formation. The duration of the period from pod formation to seed ripening varies between 15 and 57 days. In the Ural mountains, with an average temperature during this period of 17–20°C, the duration is 21–22 days, but at 9–13°C, 53 or 54 days are required. To obtain a seed yield of 1000 kg/ha, a total of 1423–1526°C is required during the vegetative period, with not less than 150–200 mm rainfall. Seed should be vernalized [before sowing] to obtain a ripe seed harvest in the mountain and northern regions. Vernalization of the seed shortens the vegetative period in cold summers by 20 days. A 4-year experiment on sowing a vetch/oat mixture in the Sverdlovsk Province showed that 25 kg vetch and 130 kg oats/ha produced a satisfactory crop resistant to lodging.—M.H.

LUPINS

See also Abs. 70, 461.

241† Nel, P. C. **Lupin seed need not always be inoculated.** *Fmg in S. Africa* 1960, **36**, No. 1, 21–2. [Stellenbosch-Elsenburg Coll. Agric.]

Inoculated and non-inoculated *Lupinus angustifolius* and *L. luteus* seeds were sown on soils which had carried lupins 2 and 7 years previously. Yields of green material were compared when they were ready for ensiling. There was no difference in green-matter yield between inoculated and non-inoculated lupins grown on land which had successfully carried lupins 2 yr previously, but where lupins had not been grown for 7 yr, inoculated *L. luteus* yielded 14·2 ton/morgen [1 morgen = 2·117 ac] compared with 11·8 ton from non-inoculated seed. With *L. angustifolius* there was little difference between the yields of crops grown from inoculated and non-inoculated seed.—S.M.J.

242† Maĭsurjan, N. A. and Edel'štejn, M. M. **[The composition of alkaloids in wild and cultivated species of lupin.]** [Russian] *Vestn. S-H. Nauki* (*J. agric. Sci. USSR*) 1960, **5**, No. 8, 64–72, bibl. 8, illus.

Information is given on the quantity of the

alkaloids lupanine, lupinine, spartein, hydroxylupanine, and certain alkaloids ($x_1 x_2 x_3$) of unknown composition, in 16 species of *Lupinus* classified as belonging to the Mediterranean region and to America.—M.H.

243† Birecka, H. and others. **Biosynthesis of alkaloids in intact and derooted plants of yellow lupine.** *Bull. Acad. polon. Sci.* 1960, **8**, No. 5, 175–81, bibl. 12. [Coll. Agric. Warsaw, and Inst. Soil Management and Fertilization, Warsaw]

The green parts of the plants are chiefly responsible for the biosynthesis of the main alkaloids in *Lupinus luteus* and in *L. albus*. The green parts do not depend on the roots for the synthesis of alkaloid precursors. F. s.—G.M.R.

PIGEON PEAS

244 Director of Agriculture, British Guiana. **Crop production trials and new crops.** *Rep. Dir. Agric. Brit. Guiana 1959* British Guiana, [n.d.], 36–7.

Sesamum indicum, *Cajanus cajan* and *Vigna sinensis* were all grown successfully on well drained beds of coastal and pegassy clay. The possibility of including these crops in a rice rotation is being investigated. Dhall (*Cajanus cajan*) grown on well drained coastal clay which received 0·25–0·5 tons of limestone + 0·5 cwt each of sulphate of potash and triple superphosphate/ac yielded 600–700 lb dry seed/ac at the first picking and, after ratooning, a further 600–700 lb/ac 5–6 months later. Of 11 varieties of sesame tested, Str. 1, NP. 7 and Inamar yielded 1690, 1619 and 1202 lb of dry seed/ac, respectively, in 4·5 months.—s.m.j.

CROTALARIA QUINQUEFOLIA

245 Ubels, E. Rijst. Groenbemesting. [**Rice. Green manuring.**] *Jaarversl. LandbProefst. Suriname 1959* 1960, 32–3, illus.

Crotalaria quinquefolia was grown as a green manure crop for rice at 18 locations in Suriname district with (a) no fertilizer, (b) 200 kg natural phosphate (30% P_2O_5)/ha, (c) 150 kg superphosphate (40% P_2O_5)/ha, (d) 200 kg natural phosphate + 100 kg K_2SO_4 (50% K_2O)/ha. Only 8 trials were successful owing to damage to the others by wandering cattle and other causes. Yields of green material, containing about 20% dry matter, 15–17 weeks after sowing, were : (a) 10·1, (b) 23·9, (c) 28, (d) 24·7 tons/ha. The best time for sowing in this district was considered to be early Jan., as opposed to mid-Nov. in the Prins Bernhardpolder [*Fld Crop Abstr.* 13 : 693], since other crops could be grown on ridges during the dry season following rice and before the green manure crop.—R.B.

DOLICHOS BIFLORUS

246 Veeraswamy, R. **Madras gets a new horse-gram.** *Indian Fmg* 1960, **10**, No. 3, 8–9, illus. [Madras Agric. Dep.]

Dolichos biflorus is suited to recently ploughed land, to cultivable wasteland and for sloping land exposed to soil erosion. A new, improved variety, Co 1, has consistently given yields 25–50% above yields of local varieties. Co 1, a vigorous semi-erect plant with spreading branches, produces buff-coloured seeds and yields 700–800 lb seed/acre. The crop is sown Oct./Nov. and is harvested Jan./Feb. taking 120 days from sowing to seed harvest.—D.B.

GENERAL

See also Abs. 368.

247† Ministry of Agriculture, Federation of Rhodesia and Nyasaland. **Legumes in Rhodesian Agriculture.** Proceedings of the Fourth Annual Conference of the Professional Officers of the Department of Research and Specialist Services of the Federal Ministry of Agriculture held at the University College of Rhodesia and Nyasaland on 9 – 11 June, 1959, pp. 131, bibl. at end of individual papers.

The following papers were presented at the Conference : Nitrogen fixation in legumes, by H. Weinmann ; Factors affecting the production of annual legumes in Rhodesia, by J. Smartt ; Legumes and the peasant farmer, by A. P. Conradie ; Preliminary remarks on insects associated with lucerne in S. Rhodesia, by C. N. Smithers; Summary of some experiments on groundnuts in Nyasaland, by S. Hoyle ; The soya bean in Rhodesia, by A. Rattray ; The testing, handling and production of legume seed, by W. E. Kerr ; Diseases of legume crops in S. Rhodesia, by J. O. Whiteside ; The importance of eelworm in the production of legumes in the Federation, by C. C. Martin ; What is the value of green manuring in Rhodesia ?, by D. H. Saunder ; The potential production of leguminous fodders in Matabeleland, by K. E. Cackett ; Legumes and other sources of protein in ruminant nutrition, by R. C. Elliott ; Dryland and irrigated pasture legumes, by K. B. Addison ; Legume nutrition with particular reference to the high rainfall sandveld of S. Rhodesia, by H. D. L. Corby ; Culture of lucerne in S. Rhodesia, by A. G. Davis. A summary is given of the discussion which followed each paper.—A.G.G.H.

248 Keleny, G. P. **Report to the Government of Indonesia on the development of leguminous crops.** *Rep. 1094 FAO* 1959, pp. 48, bibl. 33.

The author visited Indonesia, from Oct. 1956

to March 1958, to advise the Government of that country on a programme of research and demonstration work with legumes. The islands visited were Java, Sumatra and the Lesser Sumba. The proposals were concerned mainly with soyabeans and groundnuts but they included studies on legumes for fodder and green manure. Information is given on the climate of central Java and on the cultivation of soyabeans, groundnuts and legumes for green manure and fodder in Indonesia. An account is given of trials to test many introduced varieties of soyabean and groundnuts, many of which yielded more than the local varieties. Many species of legumes for fodder or green manure from Indonesia, and introductions from India and Papua, were also tested. Recommendations are made.—E.B.O.

249† FAO. **Report of the FAO/CCTA technical meeting on legumes in agriculture and human nutrition in Africa, held in Bukavu, Belgian Congo, 10-15, November, 1958.** *Meet. Rep. 1958/22 FAO* 1959, pp. 68, bibl. 92. [Received July, 1960]

This meeting, attended by delegates from many countries, was concerned primarily with legumes used in human nutrition, and to a lesser extent with those used for other purposes. The agricultural section of this report is based on discussions at the meeting and on the limited amount of information supplied by countries in Africa ; earlier FAO publications on related aspects of the subject [see *Fld Crop Abstr.* 6: 1585 and 12 : 1631] provided the background material. Among the subjects discussed were : present situation regarding the production of grain legumes and their place in farming systems ; legumes for animal feeding ; the improvement of legumes, including those used for fodder ; the effect of legumes on soil fertility ; legume/bacteria relationships ; the mineral nutrition of legumes. Recommendations are made on measures for increasing the production of legumes. Tables give their chemical composition, their scientific, English and French names, and synonyms.—E.B.O.

ROOT CROPS

SUGAR-BEET

See also Abs. 378, 380, 422.

250 Musillami, S. La barbabietola da zucchero nell'interno collinare della Sicilia. [**Sugar-beet in the hilly region of the interior of Sicily.**] *Tecnica agric.* 1960, **12**, No. 1, 63–8, bibl. 1, illus.

In trials in 1954–8, several sugar-beet varieties were grown in the hilly region of the interior of Sicily, after and before wheat. Tables show percentages of bolting, and sugar yields of the varieties tested. It is concluded that there are possibilities for growing sugar-beet without irrigation in that region, where the best time for sowing is late Nov. to early Dec. and the best time for harvesting 1–20 July.—E.B.O.

251 Nogin, P. [**Sugar-beet in the Irkutsk Province.**] [Russian] *Sel'hoz. Sibiri* (*Agric. Siberia*) 1960, **5**, No. 4, 35–6. [Irkutsk Agric. Inst.]

252 Ruškovskiĭ, T. V. **Development of sugar-beet cultivation in the Altaĭ.** [Russian] *Vestn. S-H. Nauki* (*J. agric. Sci. USSR*) 1960, **5**, No. 8, 59–63.

The period required by sugar-beet from sowing to seedling emergence in the Altaĭ [approx. 53°N., 85°E.] varies between 10–15 days, and from seedling emergence to the appearance of the first two leaves, 12–15 days. In the European SSR, the normal duration of these periods for sugar-beet is 10 days. Observations were made at the Biĭsk Experiment Station on the growth of beet sowings under certain cultural measures, including crop rotation, tillage, fertilizers and sowing date ; for best results, sowing date should be when the 5–10 cm soil horizon is at 6–8°C, i.e. usually between 25 April and 10 May. In 1960 more than 10,000 ha were sown in the Altaĭ with monogerm seed. It has been calculated at Biĭsk that 10–15% of labour in thinning is saved when monogerm seed is used, although, compared with multiple-germ seed, monogerm seed is more exacting in regard to soil fertility. The Altaĭ Province is the only area in Siberia where sugar-beet is grown on a commercial scale, the area sown in 1960 amounting to 60,000 ha.—M.H.

253 Stout, B. A. and others. **The effect of soil compaction on moisture absorption by sugar beet seeds.** *Quart. Bull. Mich. agric. Exp. Sta.* 1960, **42**, No. 3, 548–57, bibl. 8, illus.

Sugar-beet seed balls were sown in boxes in sandy loam at 0·3 or 2·5 atm. soil moisture tension before compaction of the soil at 0, 5, or 15 lb/in.^{2}. Seed balls in compacted soil initially absorbed water at a greater rate than in uncompacted soil, but after 2–5 hr seed in uncompacted soil contained significantly more moisture. Compaction had no effect on the final moisture content of the seed balls. It was suggested on theoretical grounds that the rate of water absorption by the seeds was dependent on the rate of capillary flow of water through the soil.—R.B.

254 Donà dalle Rose, A. Sull'analisi delle marche commerciali del seme bietole poliploide. [**The analysis of commercial types of polyploid sugar-beet seed.**] *Agricoltura d. Venezie*

1960, **14**, No. 6, 248–56, bibl. 1, illus. [Sta. Sper. Bieticolt., Rovigo, Italy]

The agricultural value of polyploid sugar-beet seed is determined by the percentage of triploid seed it contains. By growing diploid and tetraploid sugar-beets in alternate rows, a seed crop containing an average of 60% triploids is obtained. It is thought that a method for analysing polyploid sugar-beet seed ought soon to be included in the official methods of seed analysis. Meanwhile, in international trade it is accepted that sugar-beet seed containing not more than 40% diploids can be classed as polyploid seed. Of the 3 methods described (1 direct and 2 indirect) for determining the degree of polyploidy of sugar-beet seed, the direct examination of chromosomes at the metaphase is considered the best for use in routine laboratory analyses.—E.B.O.

255 Murant, A. F. **Experiments in 1958 with propham and endothal for controlling weeds in sugar beet.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 149–54, bibl. 3. [Norfolk Agric. Sta., Sprowston]

Pre-emergence applications of propham, endothal and a propham-endothal mixture were compared in 6 experiments for weed control in sugar-beet. Both treatments containing endothal gave promising results and were more effective than propham alone. Results indicated that endothal was less suitable for post-emergence use. F. s.—A.M.H.

256 Adams, S. N. **The value of calcium nitrate and urea for sugar-beet, and the effect of late nitrogenous top dressings.** *J. agric. Sci.* 1960, **54**, Pt 3, 395–8, bibl. 7. [Rothamsted Fld Sta., Dunholme, Lincs.]

Twenty-eight experiments on sugar-beet in 1956–8 compared ammonium sulphate, calcium nitrate and urea applied at 0, 0·6 and 1·2 cwt N/ac to the seedbed before sowing. In 1 treatment 0·6 cwt N/ac was held back until the end of June. Average responses in sugar yield were low. Dressings heavier than 0·6 cwt N/ac substantially increased the yield of tops. The 3 forms of N were equally effective in raising sugar yield. Applying N to the seedbed was as effective as a split dressing in raising sugar yields. F. s.—S.M.J.

257 Plaut, M. and Prion, I. **A method of taking sugar beet samples in the field.** *Ktavim* 1960, **10**, No. 1, 3–4, bibl. 4.

When sampling 100 beet roots from an experimental plot by a new method (instead of using entire beets), small cylindrical samples weighing 18–24 g are taken from each of 100 roots by a special " borer". The samples are placed in plastic bags (containing a teaspoonful of paraformaldehyde) which are sealed and kept for about 2 hours in a cool place before being put in cold storage.—M.H.

FODDER-BEET AND MANGELS

258† Eifrig, H. Die Einkeimung in gefalteten Filterstreifen, eine neue Keimmethode für Beta-Arten. [**Germination in strips of folded filter paper, a new method for germinating *Beta* spp.**] *Saatgut-Wirtsch.* 1960, **12**, No. 9, 249–51, bibl. 3, illus. [Samenprüfstelle der Landw-Kammer Westfalen-Lippe, Münster (Westf.), German Fed. Rep.]

Strips of filter paper (details of quality and size given), folded concertina-wise, are used for this new method of germinating seed of *Beta* spp. The seed is first soaked ; glomerate seeds for 15 hr overnight and monogerm seed for 2 hr at room temperature. The seeds are equally spaced out in the 2-cm-high folds of filter paper which is placed in a rectangular polystyrole dish where germination takes place. This method, when used for fodder-beet, mangel and beetroot, gave somewhat higher germination values than did the methods formerly used.—D.B.

TURNIPS AND SWEDE-TURNIPS

See also Abs. 358.

259 Jameson, H. R. **γ-BHC liquid seed dressing for the control of turnip flea beetle [*Phyllotreta nemorum*].** *J. Sci. Fd Agric.* 1960, **11**, No. 9, 528–34, bibl. 3. [ICI, Jealott's Hill Res. Sta., Bracknell, Berks]

Viscous aqueous seed dressings containing up to 16% γ-BHC, prepared for use as seed dressings against flea beetle attack on turnips [*Brassica campestris*] and kale [*B. oleracea*] did not impair germination when applied at 50 ml per lb of seed. The dressed seed dried quickly, was not dusty, and was ready for drilling in about 0·5 hr. In field experiments, one of these dressings, containing only 4% of γ-BHC, was highly effective in controlling flea beetle on seedlings, even against attack occurring up to 3 weeks after the seed was sown. F. s.—S.M.J.

260† Hemingway, R. G. **Effects of salt and other fertilisers on yield and mineral composition of forage crops. 1. Turnips.** *J. Sci. Fd Agric.* 1960, **11**, No. 7, 349–55, bibl. 31. [Agric. Chem. Dep., Univ. Glasgow]

The literature concerning the influence of Na on P utilization by plants is reviewed. During fertilizer investigations, the application of 3 or 6 cwt sodium chloride/ac resulted in greater yields of turnips [*Brassica campestris*] than did 1 or 2 cwt muriate of potash/ac. There were consistent negative interactions between NaCl and K. Muriate of potash greatly depressed P uptake and sodium

chloride increased it by about 50%. Common salt was shown to improve the uptake of P and there were negative interactions of importance between salt and superphosphate for both the yield and P content of the roots. F. s.—s.m.j.

261† MacLeod, L. B. and others. **A long-term field experiment with commercial fertilizers and manure. 1. Fertility levels and crop yields in a rotation of swedes, oats and hay.** *Canad. J. Soil Sci.* 1960, **40**, No. 2, 136–45, bibl. 7. [Canada Dep. Agric., Exp. Fm, Nappan, N.S. and Res. Sta., Kentville, N.S.]

Yields of swedes, oats and hay [spp. not given] grown in a 3-yr rotation between 1936 and 1957 under 20 manurial treatments involving various rates of N, P, K, B and f.y.m., and the effects of the treatments on soil properties, are given. Manurial treatments were applied only to swedes ; yield differences for this crop were greater than for oats or hay. There was a tendency for yields of the last 2 crops to decline during the experiment. P had the greatest influence on crop yields. F.y.m. had considerable residual effects.—r.b.

POTATOES

See also Abs. 368, 380.

262 Singh, R. **Soil and water conservation in catchment areas.** *J. Soil Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 74–8, bibl. 6. [Suket For. Div., H.P.]

Cultivation practices which lead to soil erosion when growing wheat, barley, maize and potato on hillsides are briefly discussed. Improvements suggested consist of terracing, crop rotations, strip cropping and contour cultivation. The following measures are suggested for potato areas : (1) replacement on steep slopes by fruit trees ; (2) ridging along the contour (allowing for a gentle slope in the trenches), or staggered [unplanned] planting with earthing-up of individual plants ; (3) adjustment of planting time so that plants cover the soil throughout the rainy season and are not lifted until the rainy season is over.—d.b.

263 Green, H. C. **Potato planting experiments.** *J. agric. Engng Res.* 1960, **5**, No. 3, 276–82, bibl. 5. [NIAE, Silsoe, Beds.]

In an investigation into the spacing requirements of Majestic, Arran Peak and King Edward potatoes grown in groups of closely spaced rows to facilitate mechanical harvesting, the number of shoots per plant was restricted by : (1) singling after emergence, (2) transplanting plants after separation from the mother tuber, (3) planting cut setts, (4) removing all but one sprout. The number of stems did not affect the number of tubers at harvest. Transplanted plants produced fewer chats and fewer small tubers per plant than did chitted seed tubers. The number of tubers per plant increased as spacing increased from 150 to 550 sq. in. The yield per acre of tubers, especially of small ones, fell rapidly as spacing increased to 450 sq. in./plant. The yield of large tubers increased with increasing spacing. Majestic produced the greatest weight per plant at 450 sq. in./plant. —s.m.j.

264 Boock, O. J. Ensaios de profundidade de plantio da batatinha. [**Trials on depth of planting potatoes.**] *Bragantia* 1959, **18**, No. 4, 41–9, bibl. 6, English summary. [Inst. Agron. São Paulo, Brazil]

As a result of field trials the following depths of planting are recommended : 10 cm for potatoes grown in the rainy season, or grown under irrigation in the dry season ; 15 cm for potatoes grown without irrigation in the dry season. F. s.—e.b.o.

265 Flocker, W. J. and others. **Effect of soil compaction on tomato and potato yields.** *Agron. J.* 1960, **52**, No. 6, 345–8, bibl. 8. [Univ. California, Davis]

Yolo fine sandy loam was compacted during 3 successive years by traffic exerting 40 lb/sq. in. 0, 2 or 7 times in autumn following sprinkler irrigation. Severe compaction produced a lumpy seed bed and reduced total yields of Kennebec and White Rose potatoes by 40 and 32%, respectively, and yields of No. 1 ware potatoes by over 50% in both varieties. The principal cause of the reduction in potato yields was considered to be the presence of air pockets in the seed beds on the severely compacted soil.—r.b.

266 Pushkarnath. **Producing healthy seed potatoes in the plains [of India] : A new approach.** *Indian Potato J.* 1959, **1**, No. 2, 63–72, bibl. 2, illus. [Central Potato Res. Inst., Simla]

The wide-spread use of virus-infected, degenerated seed potatoes in India limits yields per acre to a very low level. With the use of healthy seed tubers it is estimated that the existing yield of 70 maunds [1 m = 82·28 lb] per acre could be doubled. In the higher hill areas conditions are favourable for the production and multiplication of disease-free foundation stocks, but these areas can at best produce only about 30% of the total seed requirements in the country. As a result of a detailed survey of aphid incidence and populations in the plains, a new technique for producing healthy seed potatoes in the plains has been developed. A method of raising seed crops during the period of low aphid infestation in the plains has been outlined. F. s.—a.g.g.h.

267 Statens Forsøgsvirksomhed i Plantekultur, Denmark. Forsøg med midler til

dræbning af kartoffeltop. [**Experiments on the chemical destruction of potato haulms.**] *Medd. 646 Stat. Forsøgsvirks. Plantekult.* 1960, pp. 4.

During 1957–9 trials were carried out at 4 locations in Denmark on potato-haulm destruction. The treatments, applied between 20 Aug. and 1 Sept. at a spray volume of 800 l/ha, were : (a) control ; (b) 12 kg $NaClO_3$/ha ; (c) 20 kg MCA/ha ; (d) 24 kg DNOC/ha ; (e) 50 l PCP/ha; (f) 6 l butylphenol + dinoseb + 60 l diesel oil/ha. Treatments (e) and (f) gave the quickest destruction of leaves and stems, but after 10 days there was little difference between any of the treatments. Treatment (f) resulted in the highest percentage of discoloured tubers. All treatments slightly increased the percentage of sprouted tubers. Shoot weight was decreased most by (b) and (c). Treatments did not affect cooking quality.—S.M.J.

268 Singh, R. and De, R. **Plant growth, tuber development and specific gravity of potato varieties.** *Indian Potato J.* 1959, **1,** No. 2, 105–11, bibl. 7. [Central Potato Res. Inst., Simla]

The effect of time of harvesting on plant growth, tuber yield, and specific gravity of tubers of 4 varieties was studied for 2 years. Growth of the plants (tops plus tubers) increased up to 117 days after planting and declined thereafter, due to a decrease in the weight of the tops. The peak period of tuber development occurred between 87 and 132 days. The maximum growth rate of tubers was observed to be between 87 and 102 days in Great Scot, between 102 and 117 days in Up-to-date and between 117 and 132 days in Kufri Red and Kufri Safed. The specific gravity of tubers increased as the plants matured, the rate of increase being high in the earlier stages. F. s.—A.G.G.H.

269 Pushkarnath. **Commerical potatoes in India : Phulwa.** *Indian Potato J.* 1959, **1,** No. 2, 124–6. [Central Potato Res. Inst., Simla]

Phulwa is probably an old European variety which has lost its identity. It has been under cultivation in India for more than a century. A new improved disease-free clone of Phulwa, Kufri Safed, has recently been developed at the Central Potato Research Institute, Simla. Tests in the plains have shown that this clone, besides producing a uniform crop of tubers, yields on average 25% more than the commercial Phulwa.—A.G.G.H.

270 Gustafsson, N. Konsumentsynpunkter på kvaliteten hos olika potatissorter. Resultat av ett preferenstest av sorterna Bintje, Bona och Up to date. **The quality of different potato varieties from the consumer's point of view.** *K. Skogs. LantbrAkad. Tidskr.* 1959, **98,** No. 3, 165–80, bibl. 11, English summary. [Inst. för Växtforskn. och Kyllagring, Nynäshamn, Sweden]

In tests in Sweden, Bintje was first in consumer preference, followed by Up-to-Date and Bona. Differences between varieties were highly significant and Bona scored particularly low marks where the quality of all 3 varieties was low. Soggy consistency and blackening after cooking were rated the most detrimental defects. Colour and mealiness did not appear to be important quality characteristics.—P.J.B.

271 Løvø, P. J. Forsøk med potetsorter. **Trials with potato varieties.** *Forskn. Fors. Landbr.* 1960, **11,** No. 3, 255–76, English summary. [Statens Forsøksgård Voll, Norway]

Results are given of 251 varietal trials with potatoes carried out at the Voll experiment station and at various locations in Møre and Romsdal and in Trøndelag between 1942 and 1956. The varieties recommended were : for industrial use, Jøssing, Parnassia, Dianella and DS × Ås No. 1006 ; for fodder production, Åspotet, and for use at higher altitudes, King George V ; as ware potatoes, Kerrs Pink. Saga and LB × RJ No. 305 gave promising results, but their value as ware potatoes has not yet been determined. F. Eng. s.—R.B.

272 Letnes, A. Sortsforsøk med fabrikkpoteter. **Experiments with potato varieties for industrial use.** *Forskn. Fors. Landbr.* 1959, **10,** No. 3, 229–49, bibl. 5, English summary.

The results are given of 99 varietal trials in different regions of Norway with potatoes for industrial use. From the results it was concluded that Parnassia was the most economic variety in most districts using industrial potatoes. It had a high starch content and medium-high tuber yield but was very sensitive to dry conditions. Dianella, much used in Denmark and Sweden, gave higher tuber yields than Parnassia in all districts but had a lower dry-matter content. Dianella stocks were completely infected with virus X and the variety was less resistant to other diseases than Parnassia. Kerrs Pink gave good tuber yields, but was highly susceptible to *Phytophthora infestans.* Other varieties tested included Jøssing, Prestkvern and Saga.—P.J.B.

273 Niederhauser, J. S. and others. Tres nuevas variedades de papa resistentes al tizón tardío. [**Three new potato varieties resistant to late blight.**] *Agricultura téc., Méx.* 1959–60, No. 9, 28–30, illus.

Descriptions are given of the varieties Anita, Bertita and Conchita, suitable for cultivation on the central plateau of Mexico during the rainy season.—E.B.O.

274 Luz, N. K. Experimentos de pulverização de batata americana. [**Trials in spraying potatoes.**] *Rev. Ceres, Minas Gerais* 1960, **11**, No. 62, 48–59, bibl. 10, English summary. [Esta. Exp. Hort., D. Petrolini, Rio Grande do Sul, Brazil]

In trials to control *Phytophthora infestans* on potatoes the following fungicides gave good control of the disease and considerable increases in yield : 0·5% cuprosan, 0·4% perenox, 0·5% copper compound A, 1% Bordeaux mixture, 0·4% cupravit Ob 21, 0·25% dithane Z-78 and 0·25% dithane M-22. The amount of liquid applied was 1000–2000 l/ha per treatment and the number of treatments varied from 2 to 5. The increase in yield obtained in one trial with 5 applications was more than 100%, compared with the control. Bordeaux mixture was somewhat toxic to the plants.—E.B.O.

275 Guntz, M. and others. Influence de quelques produits anticryptogamiques sur le rendement de la pomme de terre : action fongicide et action physiologique. [**Influence of some fungicides on the yield of potatoes: fungicidal effect and physiological effect.**] *Ann. Épiphyt., Paris* 1958, **9**, No. 4, 517–50, bibl. 33. [Sta. Cent. Path. Vég., Versailles, France] [Received Aug., 1960]

An account is given of trials in 1954–6 to study the best conditions for applying fungicides, including various copper preparations, zineb and mixed preparations, for the control of blight [*Phytophthora infestans*] on potatoes. The copper preparations gave the best control of blight but were phytotoxic, while zineb gave less effective control but was not phytotoxic. Both the fungicidal effect and the phytotoxic effect, however, varied with years, date and region of application. —E.B.O.

276 Graham, D. C. **Control of *Rhizoctonia solani* on potato by disinfection of seed tubers with organo-mercury compounds.** *Europ. Potato J.* 1960, **3**, No. 1, 80–9, bibl. 6, French and German summaries. [Dep. Agric. Scotland, East Craigs, Edinburgh]

The effects of 9 organic Hg compounds with or without 5 wetting agents on the germination of sclerotia of *Rhizoctonia solani* in potato tubers 2–3 months after lifting were investigated. Solutions of methoxyethyl mercury chloride and ethoxyethyl mercury chloride containing 100 ppm Hg, used as dip treatments, were the most suitable, but did not prevent germination of all sclerotia. Methylmercuridicyandiamide, the most effective compound, tended to depress sprouting. The addition of a wetting agent to the disinfecting solution increased its effectiveness. Disinfection of tubers dipped for 15 min in solutions at 6·5, 16·5, 27 and 39°C became more effective as the temperature was raised.—R.B.

277 Smedgård, G. TMTD-betning mot potatisens filtsjuka. [**Disinfection with TMTD to counter stem canker of potatoes.**] *Lantm. Svenskt Land* 1959, **70**, No. 13, 261–3 and 264, illus. [Plönninge Agric. Sch., Harplinge, Halland, Sweden]

Disinfection of seed potatoes with thiram dust at the rate of 1 g per kg potatoes has been found effective in preventing the disease [caused by *Rhizoctonia solani*]. Moderate overdosing with the disinfectant causes no damage.—G.M.R.

278 Boyd, A. E. W. **Fungicidal dipping and other treatments of seed potatoes in Scotland.** *Europ. Potato J.* 1960, **3**, No. 2, 137–54, bibl. 13, French and German summaries. [Edinburgh Sch. Agric.]

A description is given of a commercial seed-potato-disinfection method in which the tubers are washed to remove soil and eelworm cysts immediately after harvesting and then immersed for 12 min in a solution of phenyl mercury acetate or ethoxyethyl mercury chloride containing 70–140 ppm Hg, or in a $HgCl_2$/NaCl/phenol mixture containing 784 ppm Hg. Where the mixture was used, tubers were washed immediately after treatment. Tubers were dried and stored in boxes. Treatment controlled dry rot (*Fusarium caeruleum*), skin spot (*Oospora pustulans*) and gangrene (*Phoma foveata*) in the varieties Doon Star and King Edward during 2 seasons. Treatment 6 weeks after lifting did not give satisfactory control. Thorough washing immediately after lifting reduced the incidence of the above diseases. In boxes containing a high proportion of small, treated tubers, lack of adequate ventilation increased the development of *Erwinia carotovora*. Treatment tended to stimulate sprouting during storage. Treatment with ethoxyethyl mercury chloride tended to increase tuber yields. —R.B.

279 Boock, O. J. Influência da adubação e da fumigação do solo, na incidência de nematóides em tubérculos de batatinha. [**Influence of manuring and soil fumigation on the incidence of nematodes in potato tubers.**] *Bragantia* 1959, **18**, No. 22, 327–35, bibl. 12, illus., English summary. [Inst. Agron., São Paulo, Brazil]

In trials to control nematodes (*Meloidogyne incognita*), which attack potato tubers in the field, the application of fertilizers had no influence. Soil fumigation with ethylene dibromide, applied in holes 20 × 20 cm apart 8 days or more before planting, reduced infestation and increased yields satisfactorily, especially when the fumigant was applied twice a year to the same plot, that is, once for the dry season crop (March–Aug.) and again for the rainy season crop (Sept.–Feb.).—E.B.O.

280 Diaz, J. R. Efectividad de varias substancias químicas inhibidoras del virus X de

las papas (*Annulus dubius* Holmes). [**Effectiveness of various chemical substances as inhibitors of potato virus X** (*A. dubius*).] *Ciencia y Natur.* 1960, **3**, No. 1, 25–34, bibl. 31, English summary. [Cornell Univ., Ithaca, N.Y.]

In trials to test several chemicals as inhibitors of virus X of potatoes, mercuric bichloride 1 part per 1000 ; heliogen 13 ppm ; Bordeaux mixture 4-2-50 and 4-4-50 ; ethyl alcohol 70% and 90% ; and saturated solutions of bentonite, sodium carbonate, trisodium phosphate and calcium hydroxide were effective for disinfecting knives (used for cutting seed potatoes) infected with the virus. Bentonite and calcium hydroxide, as dusts, were effective for protecting the cut surfaces of potatoes. —E.B.O.

281 Nilsson, L. Glasighet i potatis, en torkskada. [**Glassiness in potatoes, a drought injury.**] *Växtskyddsnotiser* 1959, **23**, No. 4, 47–51, bibl. 9.

A note is given on the symptoms and cause of glassiness in potato tubers, instances of which were reported in crops of Bintje in the vicinity of Landskrona, Sweden, in 1957 which was a very dry and warm year up to the beginning of August, but very wet during the rest of August and September. —P.J.B.

282 Hesen, J. C. and Kroesbergen, E. **Mechanical damage to potatoes. 1.** *Europ. Potato J.* 1960, **3**, No. 1, 30–46, illus., French and German summaries. [Inst. Bewar. Verwerk. Landb-Prod., Wageningen, Netherlands]

Six types of mechanical damage to potatoes are illustrated. Results from a mechanical potato harvesting demonstration in the Netherlands in 1957 showed that less damage to the crop occurred on clay soil than on sandy soil, and where the machines were set for deep lifting. Tuber damage caused after harvesting is discussed. [See *Fld Crop Abstr.* 12 : 1395.]—R.B.

283 Lampe, K. Die Widerstandsfähigkeit von Kartoffelknollen gegen Beschädigungen. **The resistibility of potato tubers to injury.** *Europ. Potato J.* 1960, **3**, No. 1, 13–29, bibl. 15, illus., English and French summaries. [Inst. Landmaschinenforschung der Forschungsanstalt der Landwirtschaft, Braunschweig-Völkenrode, W. Germany]

Apparatus for measuring the sensitivity of potato tubers to mechanical damage is described and illustrated. The minimum load required to cause a cylindrical pin 3 mm diam. to penetrate the tubers was used as an index of resistance to damage. Sixteen potato varieties grown during 1957 at Clausthal (585 m alt.), Ebstorf (70 m alt.) and Rethmar (57 m alt.) were tested. The resistance to damage of Suevia, Maritta and Benedikta was influenced most by location, while that of Fina, Olympia and Lerche was little affected. The difference in the load required to damage the most resistant and the most sensitive variety was 700 g for potatoes grown at Rethmar and 370 g for those grown at Clausthal. Where tubers were stored at 4–5°C and 85–95% R.H., the resistance to damage of those grown at Clausthal increased until Jan. and then slowly declined, while those grown at the other 2 locations displayed resistance maxima in autumn and spring. Among 7 varieties grown at Ebstorf during 1956 and 1957, Heida and Bona were almost equally resistant to damage in both years, Sieglinde and Benedikta were most resistant in 1957, and Capella and Ackersegen in 1956. [See *Fld Crop Abstr.* 13 : 806.]—R.B.

284 Gončarik, M. N. [**Growth and development of *Solanum tuberosum* in the valley of the Eniseĭ River north of the Arctic Circle.**] [Russian] *Bot. Ž., SSSR* (*Bot. J., USSR*) 1960, **45**, No. 4, 507–23, bibl. 30, English summary. [Biol. Inst., Acad. Sci. Belor. SSR, Minsk]

It has been established that fluctuations of the influences of meteorological factors within any one climatic zone, together with variation in cultivation measures, affect the potato plant more than they do other crops. At the Igarka Agricultural Experiment Station (of the Institute for Agriculture in the Far North) a study was made of the effect of environment on growth and development of the potato plant on the basis of the growth-curve method (Girard, *C.R. Acad. Sci. Paris*, 1889), and of data obtained from the Igarka Station [approx. 68°N., 87°E.]. It was shown that the plants there pass all the growth stages more rapidly than at lower latitudes, tuber formation beginning 6 days earlier and the maximum weight of the above-ground organs (photosynthetic tissue) being achieved 17 days earlier. In Igarka the (5-year) average date for planting potatoes is 18 June, plants appear on 3 July, tuber formation begins on 25 July and ends by 4 Sept. (the onset of frost). In spite of the short periods of vegetation and tuber formation, tuber yields are relatively high (compared with those in lower latitudes) because of the high rate of photosynthesis.—M.H.

285 Krug, H. Zum photoperiodischen Verhalten einiger Kartoffelsorten. [**The photoperiodic behaviour of a number of potato varieties.**] *Europ. Potato J.* 1960, **3**, No. 1, 47–79, and No. 2, 107–31, bibl. 77, illus., English and French summaries. [Inst. Pflanzenbau u. Saatguterzeugung der Forschungsanst. für Landwirtschaft, Braunschweig-Völkenrode, W. Germany]

The photoperiodic behaviour of the potato varieties Erstling [Duke of York], Ackersegen, Vera, Bona, Forelle and Virginia was investigated in the field and in controlled environments. The

minimum light intensity required to cause plants to change from the short-day form to the long-day form was between 4 and 100 lux, with a mean value of 20 lux. Under field conditions, slightly less than half of the twilight period could be regarded as photoperiodically active. With 12 hr light/day, haulms reached a shorter final length, leaves were softer and more susceptible to fungal attack, tubers developed earlier and on shorter stolons, and yields were lower, than with 18–21 hr light/day. The critical daylength for transition between short and long days was 12–14 hr for Ackersegen. The critical daylength tended to be greater at lower temperatures. Supplying 20–40 short days produced an irreversible short-day induction in all varieties tested. Transfer to long days, following partial short-day induction, caused a partial reversal to the long-day type of plant, the extent of which depended on the number of short-day cycles to which the plants had been exposed. [See *Fld Crop Abstr.* 12 : 1389 and 13 : 799.] F. Eng. s.—R.B.

286 Courduroux, J. C. Température et tubérisation chez la pomme de terre. [**Temperature and tuber-formation in the potato.**] *Bull. Soc. bot. Fr.* 1959, **106**, No. 7–8, 322–4, bibl. 3.

From the trials described it was concluded that the factor which induces the formation of tubers in the potato var. Bintje is a low night temperature (about 14°C) and not the photoperiod. —E.B.O.

287 Petróczi, I. and Theiss, A. Az ökológiai tényezök szerepe a burgonya cérna- es vékonyhajtás-képzésében. **The role of some ecological factors in thin-sprouting of potato.** *Növénytermelés* 1960, **9**, No. 2, 131–40, bibl. 17, illus., English summary 139–40. [Univ. Agric. Sci., Gödöllö, Hungary]

Differences between individual potato plants were eliminated by using twin tubers. One part (A) was grown under dry weather conditions, the other part (B) only after sufficient precipitation. Experiments, begun in 1953, showed that a great number of thin sprouts developed from the A tubers while the B tubers, though planted later, produced thick, healthy sprouts. There were no great differences in starch and protein contents. In field experiments sprout emergence in the A tubers was delayed by 3–4 to 7–14 days, a difference which was not lost during the later phases of vegetative development. The difference between average tuber yield in B and A respectively (241–136 = 105) amounted to 64% in favour of B. F. Eng. s.—G.M.R.

288 Fischnich, O. and Heilinger, F. Die Kartoffel. Bildung, Erhaltung, Verwertung ihrer Inhaltsstoffe. [**Formation, maintenance and utilization of the chemical constituents of the potato tuber.**] *Angew. Bot.* 1959, **33**, No. 2, 49–70, bibl. 78. [Forschungsanst. f. LandwSch., Braunschweig-Völkenrode, German Fed. Rep.]

This is a literature review on (1) the nature of the starches, sugars and proteins and of the distribution of vitamin C in potato tubers ; (2) varietal differences in chemical composition ; and (3) the influence of soil, manure, climate and storage on the chemical composition. The utilization of potatoes is discussed in the light of their chemical composition.—D.B.

289 Journal of the Department of Agriculture, South Australia. **Potato research in South Australia.** *J. Dep. Agric. S. Aust.* 1960, **63**, No. 12, 517–21.

In fertilizer trials with potatoes in S. Australia the best results were obtained when N was applied after emergence. For optimum yields in the Adelaide Hills 2 cwt potash was required/ac and 4 cwt/ac in the Mil Lel area. Potash is essential for potatoes in S. Australia and only sulphate of potash should be used. Heavier dressings of P were required in the Adelaide Hills districts than in South East areas of S. Australia. Zineb gave the best control of target spot [*Alternaria solani*]. South Australian potato varieties had the lowest starch content ; Sebago, Kennebec and Katahdin had medium starch content. Pontiac contained only 12% starch.—S.M.J.

290 Pushkarnath and Patil, B. H. **Time and method of application of fertilizers to potato crop in the hills [of India].** *Indian Potato J.* 1959, **1**, No. 2, 99–104, bibl. 11. [Dep. Agric. Himachal Pradesh]

291 De, R. and Singh, R. **Effect of nitrogen fertilization on yield and chemical composition of potato.** *Indian Potato J.* 1959, **1**, No. 2, 76–83, bibl. 13. [Central Potato Res. Inst., Simla]

292 Widdowson, F. V. and others. **The value of calcium nitrate and urea for main-crop potatoes and kale.** *J. agric. Sci.* 1960, **55**, Pt 1, 1–10, bibl. 5. [Chem. Dep., Rothamsted Exp. Sta., Harpenden, Herts]

In 22 experiments on main-crop potatoes in 1955–7 in which the effect of calcium nitrate and ammonium sulphate applied to the seedbeds before planting was compared, only small responses to N were obtained. The optimum application of fertilizer was 1 cwt N/ac in 1955 and 0·5 cwt N/ac in 1956 and '57. Calcium nitrate generally gave lower yields of tubers than ammonium sulphate especially at the higher rates (1·5 cwt N/ac). During 1956–7 urea was applied as a top-dressing. Where urea contained less than 1% biuret, crop

emergence was not affected and yields were similar to where ammonium sulphate was applied. Where the urea contained 4·5% biuret, emergence was delayed and plant numbers reduced. The effect was greatest at the higher levels of application, viz. 1 or 1·5 cwt/ac and where urea was broadcast over furrows before hand planting.—S.M.J.

293 Šikina, A. P. [**The effect of chemical preparations which impede sprouting of potatoes on seed quality of the tubers and productivity of the plants in summer plantings.**] [Russian] *Izv. Akad. Nauk Kazah SSR* (*Bull. Acad. Sci. Kazah SSR*) Ser. Biol./Pedology, 1960, No. 1, (7), 15–26, bibl. 21.

In all regions of the Kazah SSR summer planting of potatoes is important, although in the southern areas it is difficult to store tubers of the preceding year for summer planting because of rapid sprouting. From a study of certain preparations, dusted on the tubers (3 g dust/1 kg tubers) in different concentrations during the autumn before storage, it is concluded that under Kazah conditions useful preparations are M–2 (α -naphthyldimethyl ether) and Y-3 (isopropyl ether 3-chlorophenylcarbamic acid) in small doses (150–200 and 5–10 mg/kg tuber, respectively).—M.H.

294 Singh, M. and others. **Control of sprouting in potatoes with growth regulators.** *Indian Potato J.* 1959, **1**, No. 2, 112–22, bibl. 11, illus. [Central Potato Res. Inst., Simla]

MENA and agermine delayed sprouting and inhibited sprout growth both at high and moderate temperatures of storage. Tuberite inhibited sprout growth consistently at moderate temperatures, as in the pre-cooling room in cold storage, but at higher temperatures was not effective. Reposine delayed sprouting and caused reduction in sprout weight in Darjeeling Red Round but not in Phulwa. Belvitan K generally had a negligible effect under high and moderate storage temperatures. The effect of MENA was less marked when the tubers were stored under sand. F. S.—A.G.G.H.

295 Boock, O. J. Inibição da brotação de tubérculos de batatinha (*Solanum tuberosum* L.). [**Inhibition of sprouting in potato** (*S. tuberosum*) **tubers.**] *Bragantia* 1959, **18**, No. 16, 233–44, bibl. 2, English summary. [Inst. Agron., São Paulo, Brazil]

Of several sprout inhibitors tested, ipnogerm (a methyl acetate preparation) applied at a rate of 300 g per 100 kg of ware potatoes was best, and reduced sprouting and loss of weight.—E.B.O.

296 Morais, A. J. de. Efeitos do anti-abrolhante isopropil N-fenil-carbamato (I.P.C.) na composição química da batata. [**Effects of the sprout-inhibitor isopropyl-N-phenylcarbamate (IPC) on the chemical composition of the potato.**] *Rev. agron., Lisboa 1958*, **41**, 23–35. [Esta. Agr. do Porto, Portugal] [Received July, 1960]

Tubers of the potato var. Arran Banner were treated with tuberite, a preparation containing IPC, at 1·2 kg per ton of potatoes, on 3 Sept., 1953, immediately after harvest, or 10, 20 or 30 days later. The potatoes were tested during the following months. During Jan.–Apr. 1954, traces of IPC were found in the pulp of washed potatoes cooked in their skins, but after May its presence was found in the cooking water only. No IPC was found in potatoes cooked without skins. The chemical composition of potatoes treated with IPC was the same as that of the controls, with the exception of the reducing sugars, which were a slightly higher percentage in the controls.—E.B.O.

297 van Vliet, W. F. and Schriemer, W. H. **Determination of nonanol residues in potatoes.** *Nature, Lond.* 1960, **187**, No. 4733, 235–6, bibl. 5. [Inst. Storage and Produce of Agric. Products, Bornsesteeg 59, Wageningen, Netherlands]

A new method for the destruction of sprouts during potato storage has been reported (*Fld Crop Abstr.* 12 : 283). The authors now describe a technique for determining the amount of nonanol in the ventilation air as well as in the potatoes after such treatment.—M.H.

298 Heilinger, F. and van Vliet, W. F. Stoffliche Veränderungen der Kartoffelsorte Ackersegen in Abhängigkeit von verschiedenen Lagerungstemperaturen. [**Material changes in the Ackersegen variety of potato depending on different storage temperatures.**] *Europ. Potato J.* 1960, **3**, No. 2, 182–7, bibl. 6, English and French summaries. [Inst. Pflanzenbau u. Saatguterzeugung der Forschungsanst. für Landwirtschaft, Braunschweig-Völkenrode, W. Germany]

Ackersegen potatoes were lifted on 8 Sept. and 6 Oct. 1958 and stored until July 1959 at 1, 4, 7 or 18°C ; respiration during storage was measured. The chemical composition of the tubers at harvest and after storage was compared with that of tubers from the 1959 crop lifted on 14 July. Respiration rates and losses of dry matter and water were least in tubers stored at 4 and 7°C. Starch losses were greatest in tubers stored at 1°C, and least in (a) those lifted on 8 Sept. and stored at 7°C, (b) those lifted on 6 Oct. and stored at 4°C. The concentration of sucrose in the tubers was greatest after storage at 1 and 18°C, while that of reducing sugars decreased with increasing storage temperature. Tubers stored at 18°C contained little more than half as much vitamin C as

those stored at lower temperatures. Those lifted on 8 Sept. contained more vitamin C before storage, and less after storage, than those lifted on 6 Oct. Tubers stored at 1°C did not sprout, and contained most proline, while those stored at 18°C sprouted strongly and contained least proline. [See *Fld Crop Abstr.* 13 : 1826.]—R.B.

299 Nilsson, H. Automatische Temperaturregulierung von Kartoffellagerhäusern. **Automatic temperature control of potato storage houses.** *Europ. Potato J.* 1960, **3,** No. 1, 1–12, English and French summaries. [Govt Res. Centre for Agric. Buildings, Lund, Sweden]

300 Ministry of Agriculture, Fisheries and Food. England and Wales. **Bulk storage of potatoes in buildings.** *Bull. 173 Minist. Agric., Fish., Fd.* 1960, pp. 38, bibl. 7, illus. London : HMSO, 3s. 6d.

301 Burton, W. G. **Trends in handling, storage and marketing of potatoes. 1-6.** [Cont. in] *Prod. Packaging* 1959, **5,** No. 11 to **6,** No. 4, total pp. 14. [Ditton Lab., Maidstone, Kent]

302 Cordoba, M. Estudio de costos de producción, labores y materiales requeridos en el cultivo de una manzana de papa. [**A study of costs of production, labour and materials required for the cultivation of a "manzana" [= 1·72661 ac] of potatoes (in Costa Rica).**] *Suelo tico* 1959, **11,** No. 42, 5–28, illus.

SWEET-POTATOES

303 Alvarez, L. E. and others. Dos nuevas variedades de camote de alta calidad. [**Two new high-quality varieties of sweet-potato (in Mexico).**] *Agricultura téc., Méx.* 1959–60, No. 9, 51–2, bibl. 3, illus.

Information, including yields and chemical composition, is given on the sweet-potato varieties Cuitzeo and Catemaco.—E.B.O.

304 Daines, R. H. and others. **Effect of plant bed temperature and seed potato dip treatments on incidence of sweet potato sprout decay caused by *Diaporthe batatatis*.** *Phytopathology* 1960, **50,** No. 3, 186–7, bibl. 8. [New Jersey Agric. Exp. Sta., New Brunswick]

The incidence of *D. batatatis* on sweet-potato sprouts was greater at 85°F than at 75° or 90°F. Of 5 fungicides used in dip treatments, semesan bel (3·2% 2-chloro-4-(hydroxymercuri) phenyl plus 12% 4-(hydroxymercuri)-2-nitrophenyl) and coromerc (10% N-phenylmercuriethylenediamine) gave the most effective control at all 3 temperatures. —R.B.

305 Gudiño, M. R. and Guevara, C. J. Combate de los barrenadores del camote en el trópico. [**Control of sweet-potato borers in the tropics.**] *Agricultura téc., Méx.* 1959–60, No. 9, 49–50, illus. [Centro Invest. Agríc., Campo Cotaxtla, Veracruz, Mexico]

Trials were carried out in 1957–8 to study the control of sweet-potato borers, which attack the tubers in the soil. The species involved include *Stenygra histrio, Silepta elevata, Phyllophaga* spp. and *Diabrotica* spp. Results showed that 2·5% heptachlor at 160 kg/ha, applied to the soil before transplanting, controlled the borers effectively.—E.B.O.

306 Martin, W. J. and Kantack, E. J. **Control of internal cork of sweet potato by isolation.** *Phytopathology* 1960, **50,** No. 2, 150–2, bibl. 12. [Louisiana State Univ., Baton Rouge]

It was shown that internal cork disease of sweet-potatoes could be controlled by planting susceptible varieties free from this disease 100 yards distant from affected crops. F. s.—R.B.

307 Jackson, W. A. and Thomas, G. W. **Effects of KCl and dolomitic limestone on growth and ion uptake of the sweet potato.** *Soil Sci.* 1960, **89,** No. 6, 347–52, bibl. 11. [N. Carolina Agric. Exp. Sta.]

Sweet-potatoes were grown on a Norfolk loamy sand with rates of K up to 0·6 me. per 100 g (468 lb/ac) and 3 rates of dolomitic limestone. The conclusions were : (a) early in the season the amount of K lost from the surface 12 in. of the soil was greater than the uptake of K by plants, but by final harvest the amount of K lost from that layer was lower than the uptake by plants, except with the highest application of KCl ; this was probably due either to a deeper penetration by the roots or to an upward movement of salts in the soil ; (b) the uptake of K by plants was very closely correlated with growth of enlarged roots ; more than 300 lb of K per ac was taken by some treatments with a linear increase in yield ; treatments receiving no KCl produced virtually no enlarged roots ; (c) plots which did not receive Mg in the form of dolomitic limestone suffered from severe Mg deficiency at high rates of K ; yield of roots, however, did not suffer as greatly as the appearance of tops indicated.—E.B.O.

308 Ampey, R. M. **Carotene distribution in the sweet potato.** *Diss. Abstr.* 1960, **20,** No. 9, 3482. [Michigan State Univ., East Lansing]

The stem-ends of roots of sweet-potato [*Ipomoea batatas*] contained more carotene than the central regions which, in turn, contained more than the root ends. The core of the roots in most cases contained more than the peel. Carotene synthesis appeared to persist in the roots for some time after

harvest. The Queen Mary and Porto Rico varieties were superior to Unit 1 in retention of carotene in the roots during storage.—P.J.B.

CASSAVA

309 Normanha, E. S. and Freire, E. S. Conseqüências da aplicação de adubos em contato com ramas de mandioca. [**Effect of applying fertilizers in contact with cassava cuttings.**] *Bragantia* 1959, **18**, Note 1, 1–4, bibl. 3, English summary. [Esta. Exp. Cent. Campinas, Brazil]

In a trial with cassava (*Manihot utilissima*), Chilean nitrate, ammonium sulphate and potassium chloride were applied in furrows immediately before the cuttings were placed in them. All fertilizer treatments delayed sprout emergence considerably and reduced slightly the number of plants in the stand. In the case of a high rate of potassium chloride the reduction in stand was considerable. F. s.—E.B.O.

COLEUS ROTUNDIFOLIUS

310 Busson, F. and others. Contribution à l'étude botanique et chimique des tubercules de *Coleus rotundifolius* (Poir.) A. Chevalier. [**Contribution to a botanical and chemical study of *Coleus rotundifolius* tubers.**] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 12, 674–9, bibl. 13, illus.

In the Sudan, the cultivation of *Coleus rotundifolius* for its edible tubers is very limited and is on the decrease. Determinations were made of the content of crude protein and amino acids in tubers of *C. rotundifolius* var. *nigra* from the Sudan, and in similar tubers grown at Marseille (crude-protein content 5·34 and 6·16% on dry matter, respectively, compared with 8·48 in potatoes). In its amino-acid composition *C. rotundifolius* is better than cassava, the cultivation of which is on the increase in Africa.—E.B.O.

FIBRE CROPS

COTTON

311 Dewez, J. La culture cotonnière dans la plaine de la Ruzizi. [**Cotton-growing in the Ruzizi plain (Congo).**] *Bull. Inform. I.N.É.A.C.* 1960, **9**, No. 3, 161–76, illus. [Sta. d'Essais de Lubarika, Congo]

312 Chaio-Hsia, T. and others. **A study on the increasing of cotton yields by alfalfa rotation system in southern part of Shansi province.** [Chinese] *Acta Agric. sinica* 1959, **10**, No. 6, 508–20, bibl. 11. [Acad. Agric. Sci., China]

Field experiments confirmed that cotton grown in rotation after lucerne produced higher yields, longer fibres and heavier seeds than cotton produced under continuous cultivation. Lucerne, when ploughed in, increased the moisture-conserving capacity of the soil within the 0–40 cm layer. F. Eng. s.—D.B.

313 Ferguson, H. and others. **The effect of fallow hoeing on cotton yields in rotations in the Sudan Gezira.** *J. agric. Sci.* 1960, **55**, Pt 2, 143–54, bibl. 9. [Res. Div., Min. Agric., Wad Medani, Sudan]

During a 12-yr experiment in the Sudan Gezira the average yields of three 3-course rotations were studied. They were : (a) dura [*Sorghum durra*], fallow, cotton ; (b) *Dolichos lablab*, fallow, cotton ; (c) fallow, fallow, cotton. The fallow was either hoed or left uncultivated during the rainy season. Where the fallows were unhoed, (b) yielded more cotton than (c), which at first gave higher yields than (a). In all rotations, hoeing the fallow maintained increased cotton yields in (a) and (b), but in (c) the response to hoeing either or both fallows decreased slowly at the same rate. Annual fluctuations in the response to hoeing were associated with rainfall. F. s.—S.M.J.

314 McKinstry, A. H. **Gatooma Research Station. Spacing/fertilizer trial [with cotton].** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1959* Salisbury, 1960, 86–7.

Cotton plants, spaced at 9, 12 and 18 in. in rows 3·5 ft apart, received 0, 20 and 40 lb N/ac as sulphate of ammonia, 0, 30 and 60 lb P_2O_5/ac as superphosphate and 0, 30 and 60 lb K_2O/ac as muriate of potash. Plots received 11 applications of insecticide (not specified). Mean yield was 823 lb seed cotton/ac. The highest yield (1125 lb seed cotton/ac) was obtained with a 9-in. spacing and fertilizer at 40 lb N and 60 lb P_2O_5/ac. The lowest yield (488 lb/ac) was obtained when plants were spaced at 18 in. and received no N and 30 lb K_2O/ac.—S.M.J.

315 Davif, K. A. [**The influence of sowing date on seedling emergence, development and yields of the cotton plant.**] [Russian] *Bjull. Naučno-Tehnic. Inform. Cojuz NIHI* (*Bull. Sci. Tech. Inform., All-Union Sci. Res. Inst. Cotton Prod.*) 1958, No. 1, 9-18. [Received Oct., 1960]

On the basis of experiments made during 1950–6 in different regions of Uzbek SSR, it is concluded that the best sowing date for *Gossypium* sp. on collective farms in the Fergana lowland is the first half of April, in the Zeravšan lowland from 5 to 20 April and in the Surhan-Dar'insk region from 25 March to 5 or 10 April.—M.H.

316 Department of Agriculture and Stock, Queensland. **Cotton growing in Queensland. 1.** *Qd agric. J.* 1960, **86**, No. 7, 407–17.

The cultivation of cotton in Queensland is described, and the choice of variety is discussed. Miller, New Mexico, Acala and Empire are the most widely grown.—S.M.J.

317 Satyanarayanamurthy, K. **Pressing problems of cotton in Andhra Pradesh.** *Indian Cott. Gr. Rev.* 1960, **14,** No. 3, 202–5. [Dep. Agric., Andhra Pradesh]

The problems dealt with are : (1) organization of cotton seed farms, (2) certification schemes for popular varieties, e.g. Westerns 1 and Laxmi, and (3) development of short-duration varieties of cotton for growing as a second crop in rice fallows or under well-irrigation in summer after harvesting the main crop.—D.B.

318 Toledo, F. F. de. Tratamento de sementes de algodão. [**Treatment of cotton seed.**] *Rev. Agric., Piracicaba* 1960, **35,** No. 2, 83–90, bibl. 5. [Esc. Sup. Agric. L. de Queiroz, Univ. S. Paulo, Piracicaba, Brazil]

In field trials seed of the cotton var. I. A. Campinas 817 was treated with 2% thimet or 2% disyston and sown on 10 Oct., 3 or 24 Nov. in furrows 10 cm deep at a rate of 4 g of seed per linear m. Treatments did not reduce germination which was as satisfactory in each case as from the untreated controls.—E.B.O.

319 Tarr, S. A. J. **The effects of fungicide-insecticide seed treatments on emergence, growth and yield of irrigated cotton in the Sudan Gezira.** *Ann. appl. Biol.* 1960, **48,** No. 3, 591–600, bibl. 9. [Bot. Dep., Univ. Exeter]

Fungicide/insecticide seed treatment, particularly with methoxyethylmercuriacetate (MEMA) and dieldrin, often improved emergence, growth and yield of irrigated Egyptian-type cotton (*Gossypium barbadense*) in the Gezira area. Such treatment reduced post-emergence wilting and death of seedlings resulting from termite attack, and also reduced pre-emergence mortality probably caused primarily by soil insects, but appeared to have little effect on the incidence of termite damage to tap-roots of mature plants at the end of the season. Termite attack tended to be worse in close rotations, and the beneficial effects of fungicide/insecticide seed treatment were greater in 3-course than in 4-course rotation plots. Certain seed treatments, notably those containing MEMA and γ-BHC, were slightly phytotoxic, but at the levels applied (0·043% mercury/seed and 0·12–0·24% insecticide/seed) this aspect seems unlikely to be of serious practical significance in the Sudan Gezira where high sowing rates are the rule ; any slight phytotoxicity would probably be outweighed by the protective effects of the treatment. Phytotoxicity tended to become more pronounced with increasing number of seeds per sowing hole. F. S.—M.H.

320 Kov, A. P. A. and Rov, K. C. U. **Sterilization of corn and cotton seeds.** *Indian Cott. Gr. Rev.* 1960, **14,** No. 3, 224–5.

Sterilization with NO_2 for 3–5 min at a concentration of 50–100 g NO_2 per cubic metre of seeds completely killed the micro-flora on maize and cotton seeds. Disinfection was more reliable than treatment with mordants.—D.B.

321 Bhagwat, V. Y. **Disinfection of cotton seed and its effect on seed viability.** *Poona Agric. Coll. Mag.* 1959, **50,** No. 3, 191–4, bibl. 8.

Laboratory experiments demonstrated that cotton seed may safely be treated (without loss of viability) with agrosan at 2 oz/15 lb seed, applied dry or as a paste, 2–3 months before sowing.—D.B.

322 Ward, C. Y. and Young, A. W. **The effect of inert coatings on the germination and seedling growth of cotton.** *Agron. J.* 1960, **52,** No. 6, 362, bibl. 3 in text. [Texas Technol. Coll., Lubbock]

Fungicide-treated seed of cotton var. Stormmaster, covered with short fibres, was coated with (a) montmorillonite clay, (b) 65% ground feldspar/35% fly ash and compared with uncoated seed in field, glasshouse and standard seed-germination trials. In germination trials, coating significantly increased percentage germination, while in glasshouse trials treatment (a) significantly reduced it. Coating had no significant effect on percentage germination in the field. Treatment (a) delayed germination by 3–7 days in all trials.—R.B.

323 McKinstry, A. H . **Gatooma Research Station. Insecticide treatment of cotton plots.** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1959* Salisbury, 1960, 83.

Cotton plant-breeding material, sown on 6 Nov. 1958, received 4 weekly applications of endrin at 0·25 lb/ac, beginning on 29 Dec. From 27 Jan., 1 lb DDT/ac was added to the 0·25 lb endrin for a further series of 4 weekly applications. The 9th application contained 2 lb DDT + 0·5 lb endrin in 20 gal water/ac and the final application, on 3 March, 0·5 lb endrin in 20 gal/ac. The early-sowing and insecticidal treatments resulted in the highest yield ever obtained at Gatooma, despite an attack by American bollworm [*Heliothis armigera*]. In the District trial the mean yield was 1668 lb [seed] cotton/ac ; the highest yield, 1847 lb/ac, was produced by Albar 637.—S.M.J.

324 Adkisson, P. L. and others. **Stalk shredding and plowing as methods for controlling the pink bollworm, *Pectinophora gossypiella*.** *J. econ. Ent.* 1960, **53,** No. 3, 436–9, bibl. 10. [Texas Agric. Exp. Sta., College Station]

Cotton crop residues were shredded by means

of 2 stalk shredders and 2 forage harvesters. A flail-type forage harvester was the most efficient in destroying green bolls and it killed up to 88% of overwintering larvae of *Pectinophora gossypiella*. Ploughing cotton crop residues into the soil killed 76–83% of larvae. In untreated plots, 52% of larvae survived the winter. F. s.—R.B.

325 Chatterjee, S. and others. **Field trials with some modern organic insecticides against termite damage in cotton crop.** *Curr. Sci.* 1960, **29**, No. 9, 356–7, bibl. 3. [Indian Agric. Res. Inst., New Delhi-12]

DDT, BHC and dieldrin were applied in the furrow before sowing cotton (variety 216 F). Rates of application were 5, 10 and 15 lb/acre. Judged by the percentage of damaged plants, the best control of termites was obtained with dieldrin at 15 lb/acre. Dieldrin at 10 lb/acre was almost as effective.—D.B.

326 Suplicy, N. and Fadigas, M. Contrôle do pulgão do algodoeiro com polvilhamento de parathion e metilparathion a 1%. [**Control of *Aphis gossypii* on cotton by dusting with 1% parathion or methylparathion.**] *Biológico, S. Paulo* 1960, **26**, No. 6, 109–10.

In the trials described 1% methylparathion and 1% parathion dusts, each applied at 35 kg per alqueire [1 alqueire = 24,200 m²], gave 100% and 98·5% control, respectively, of *Aphis gossypii* on cotton, 6 days after treatment, against an increase of 207% in the untreated controls.—E.B.O.

327 Tsung-Li, W. and Yuan-Ling, H. **An investigation on the characteristics of the photo-stage development of the Kiayuan free-seeded cotton (*G. barbadense* L.).** [Chinese] *Acta bot. sinica* 1960, **9**, No. 1, 1–15, bibl. 24, illus., English summary. [Kiangsu Branch, Acad. Agric. Sci., China]

328 Berninger, E. Étude de l'allogamie du cotonnier à la Station de Tikem. [**Study of cross-fertilization in cotton at Tikem Station (Chad).**] *Cot. et Fibr. trop.* 1960, **15**, No. 1, 14–22, bibl. 2, English summary.

329 Christiansen, Meryl N. and Moore, R. P. **Seed coat structural differences that influence water uptake and seed quality in hard seed cotton.** *Agron. J.* 1959, **51**, No. 10, 582–4, bibl. 11, illus. [N. Carolina Agric. Exp. Sta., Raleigh]

Water enters the cotton seed by an opening in the palisade layer at the chalazal end. In hard seed this opening is made impervious by a chalazal cap and a seal between the cap and the palisade layer. When seeds were placed in water at 80°C for at least 1 min, the cap and seal became permeable, water entered and the palisade layer swelled. Piercing the chalazal aperture plug with a very small needle, treatment with ether or ethanol or mechanically breaking the seed coat were also successful in breaking dormancy. F. s.—A.M.H.

330 Chollet, M.-M. Les glucides de réserve et membranaires chez quelques *Gossypium*. [**Reserve carbohydrates and carbohydrates of the cell-wall in some species of *Gossypium*.**] *Bull. Soc. bot. Fr.* 1959, **106**, No. 9, 409–13, bibl. 5.

This study was carried out with stems, leaf stalks and leaf blades of *Gossypium herbaceum*, *G. hirsutum* and *G. hybridum*.—E.B.O.

331 Bhagvandoss, M. and Kamalanathan, S. **A study on the causes for the higher ginning outturn at the Lower Bhavani Project area.** *Indian Cott. Gr. Rev.* 1960, **14**, No. 1, 50–3, bibl. 8. [Bhavanisagar and Coimbatore, Madras State]

Similar varieties of cotton gave a higher ginning out-turn at Bhavanisagar than at Coimbatore. The cause was found to be due not to an increase in lint weight arising from number, length or density of fibres, but to a decrease in seed weight, the cause of which was ill-filled seeds [poorly developed embryos]. This was confirmed by the lower germination percentage at Bhavanisagar.—D.B.

332 Muhitdinov, U. [**The effect of defoliants on leaf fall of cotton plants under conditions of varying soil moisture.**] [Russian] *Doklady Akad. Nauk Uz. SSR* (*Proc. Acad. Sci. Uzbek SSR*) 1960, No. 1, 43–5, bibl. 8.

It has been claimed that with inadequate supplies of water to the cotton plant the effectiveness of defoliants is lowered. There is also evidence that excessive irrigation at the time of boll ripening lowers the effectiveness of defoliants. Experiments were designed (4 replications) with the cotton variety 108-F to study the effect of: (a) a 1·5% solution of calcium cyanamide in mixture with sodium fluosilicate (2 : 3); (b) a preliminary treatment with a 10% solution of calcium nitrate, followed by a preparation of calcium cyanamide (50–60 kg/ha); (c) 0·4% preparation of magnesium chlorate. The solutions were sprayed so that all leaves were completely wetted, and fallen leaves were counted on the 6th, 12th and 18th days after treatment. With soil moisture 60% of full moisture capacity (a normal percentage at the boll-ripening period [in Uzbekistan]) on the 18th day, treatment (a) resulted in 75% leaf-fall, treatment (b) 88% and (c) 90%. Lowered percentages of leaf-fall with 80% soil moisture (63, 82 and 80%, respectively) are attributed to the water-saturated condition of the leaves which lowered the con-

centration of the preparation and consequently the young upper leaves were unaffected by treatment. The lessened effect of the defoliants with 40% soil moisture (48, 60 and 59% leaf-fall, respectively) is attributed to the impaired physiological activity of the leaves, their flaccidity, and slow reaction to the treatment. Two or 3 days before treatment, some of the wilting plants were given a small amount of irrigation. This improved the reaction of the plants to the defoliants to some extent, but leaf-fall was still less than that under 60% soil moisture.—M.H.

333 Trofimova, R. K. **[Content of nitrates and phosphates in leaves of the cotton plant in relation to water supply.]** [Russian] *Doklady Akad. Nauk Uz. SSR* (*Proc. Acad. Sci. Uzbek SSR*) 1960, No. 1, 39–42, bibl. 8.

The author's tests show that with 40% soil moisture (deficient) and 80% (abundant) there is an increase in the nitrates of the leaves at the budding and flowering stages compared with 65% soil moisture (control). When tested between 1 and 2 p.m. at the budding stage (and with 40% soil moisture) the nitrates amounted to 17·0 mg/l of solution ; with 80% soil moisture the nitrates were 22·0 mg compared with the control (9·5 mg). The corresponding figures at flowering were 6·9 mg, 5·0 mg and 2·7 mg, respectively. The phosphate content of the leaves was much less subject to the effects of inadequate soil moisture. There was (in 1954 tests) a higher phosphate content (at budding stage) with 40% and 65% soil moisture (17·5 mg/l and 16·5 mg, respectively) compared with 80% soil moisture (13·0 mg). In the 1956 tests no change was observed in phosphate content of the leaves in relation to water supply. The author claims that the plant's requirement of nitrates and phosphates could be determined from the osmotic pressures of the leaves, which is characteristic of the plant's water supply ; a pressure of 10·7 – 12 atmospheres corresponds to 65% soil moisture, which is the most suitable for growth and development of the crop. With 40% soil moisture, the osmotic pressure ranges from 13·7 to 14·6 atm. It is concluded that, under conditions of the tests, an osmotic pressure of 11 or 12 atm. is an indication that the plant is supplied with nitrates and phosphates.—M.H.

334 Mendes, H. C. Nutrição do algodoeiro. 1. Sintomas de deficiências minerais en plantas vegetando em soluções nutritivas. **[Cotton nutrition. 1. Symptoms of mineral deficiencies in plants grown in nutritive solutions.]** *Bragantia* 1959, **18**, No. 30, 469–81, bibl. 4, illus. [Inst. Agron. São Paulo, Brazil]

The principal visual symptoms of N, P, K, Ca, Mg, S and Fe deficiencies in cotton plants are described and illustrated. F. s. —E.B.O.

335 Smith, R. and Cross, J. E. **Manurial trials [with cotton].** *Progr. Reps Exp. Stas Emp. Cott. Gr. Corp., Tanganyika Terr., E. Prov. 1958–59* 1960, 3–4.

Cotton plots near Ilonga, on land continuously cropped for 10 yr, received applications of 0 and 5 tons f.y.m./ac at sowing, 0 and 2 cwt sulphate of ammonia/ac at flowering and 0 and 75 lb phosphate/ac at sowing, in all combinations. Plots given P alone [amount not stated] yielded 1212 lb seed cotton/ac compared with 1020 lb/ac from the untreated plots. N and f.y.m. alone had little effect but together resulted in yields of 1272 lb/ac. P + f.y.m. plots yielded 1476 lb/ac and P + N + f.y.m., 1452 lb/ac. The large response to P indicated that P may be a limiting factor in this area on soils which have been cultivated for a number of years.—S.M.J.

336 Sadiki, M. M. and Khan, A. M. **Manuring of cotton. Pt 2. Manuring cotton with organic and inorganic manures.** *Pakistan Cotts* 1960, **4**, No. 4, 303–7, bibl. 6. [Agric. Coll., Tandojam]

Compared with the control, 50 lb N/acre applied as organic or inorganic manure gave an average increase of approx. 165–410 lb seed cotton per acre. Bone meal gave the greatest increase and was followed by NH_4NO_3. The least increase was given by $(NH_4)_2SO_4$ and f.y.m. ; these, however, were the only ones to yield a net profit. It is recommended that the use of urea (costs for which are not given) should be encouraged for cotton cultivation in Pakistan.—D.B.

337 Souto, M. C. Alguns aspectos económicos do algodão : referência especial a Moçambique e Angola. **[Some economic aspects of cotton, with special reference to Mozambique and Angola.]** *Agros, Lisboa* 1960, **43**, No. 3, 197–211, bibl. 12, English and French abstracts.

Data of cotton areas and production are given. —E.B.O.

338 Van de Walle, B. Essai d'une planification de l'économie agricole congolaise. **[An attempt at planning the agricultural economy of the Congo.]** *Sér. tech. 61 INÉAC* 1960, pp. 67, maps.

Cotton is among the main crops considered. —E.B.O.

FIBRE FLAX

339 Koroleva, F. S. **[Autumn ploughing of a herbage cover and its effect on uniformity in stem length of a subsequent crop of flax.]** [Russian] *Lën i Konoplja* (*Flax and Hemp*) 1960, **5**, No. 9, 21–3, illus. [All-Union Sci. Res. Inst. Flax]

Uneven stem length in flax crops has been attributed to the effect of various factors. The author maintains that the primary cause is the lack of uniformity in distribution of nutrients in the ploughed layer of the soil. The upper horizon of the soil in which herbage has been grown during 2 consecutive years contains a high proportion of organic residue (e.g. 8500 kg/ha in the 0–10 cm horizon and 1000 kg in the 11–20 cm horizon). It is claimed that when herbage sod is ploughed (with coulter attached), the nutrients are unevenly distributed. There is evidence that flax growth is retarded when available P and K are deficient, and that while a stand in which growth is initially uneven may become more uniform at harvest time, the quality of the fibre is low when the plants have been retarded in their early growth. Cultural measures to obviate these effects include (1) ploughing the herbage sod in Sept. for central provinces of the non-chernozem zone, in Sept./Oct. for western areas and the Baltic region, and in Aug. for western Siberia ; (2) ploughing the herbage sod with the coulter placed 35 cm from the point of the main share and ensuring that the sod is laid evenly in the furrow ; and (3) applying P and K [amounts not specified] to the soil before tilling.—M.H.

340 Frederiksen, P. S. Undersøgelser over spindhørrens rusketid. [**Investigations of pulling dates for fibre flax.**] *Lin* 1959, **13,** No. 5/6, 65–71, bibl. 3. [Forskningsinst. for Handels- og Industriplanter, Kolding, Denmark]

The results are given of 16 trials during 1949–57 in Denmark in which fibre flax was pulled at 3, 4, 5, 6 or 7 weeks after the beginning of flowering. Where the flax was water-retted, pulling could be postponed until 6 weeks after the beginning of flowering and total profitability was highest for flax pulled at this time (2312 kr/ha). With half dew-retted flax, economic profitability was highest for that pulled at 5 weeks after flowering (2701 kr/ha) and for this type of retting, the normal pulling time was preferred.—P.J.B.

341 Marciotte, C. V. Catalogación de variedades. [**Catalogue of varieties of fibre flax.**] *Rev. Invest. agric., B. Aires* 1958, **12,** No. 1, 97–104, bibl. 8. [Esta. Exp. Agropec., Pergamino, Argentina] [Received Aug., 1960]

Information is given on the following varieties of fibre flax : Mapún M.A., Pergamino Mapún 52 M.A.G., Achay M. A., Calchaquí M. A. G., Pergamino Calchaquí 53 M.A.G., Pergamino Mocoví M. A. G. and Ranquel M. A. G. (the last is a dual-purpose variety).—E.B.O.

342 van der Spek, J. De bestrijding van *Botrytis* in lijnzaad. **Control of *Botrytis* infection of flax seed.** *Tijdschr. PlZiekt.* 1960, **66,** No. 2, 91–101, bibl. 10, English summary. [Inst. PlZiektenk. Onderz., Wageningen, Netherlands]

Measures favouring rapid drying of the flax crop after rain, which reduce infection of the plants by *Botrytis* spp. and subsequent infection of the seed, are : (a) manuring so as not to cause lodging; (b) avoiding too dense a stand ; (c) using a low-growing undercrop so that superfluous vegetation will not hinder drying of the harvested bundles ; (d) avoiding making bundles too bulky ; (e) careful stacking. Seed should be saved from healthy crops only. Seed treatment with volatile mercurials gave satisfactory control provided that seed was stored for 3 weeks or more between treatment and sowing. The effectiveness of such treatments was not influenced by temperature within the range 2·5 — 20°C nor by seed moisture contents below 13%. Extremely volatile liquid fungicides required special apparatus for adequate seed treatment. Redistribution of such fungicides in the vapour phase between seeds was only partial. Disinfection of seed damaged during threshing tended to reduce germination. Damaged seed should be treated with fungicides based on thiram, captan or quinone irrespective of the degree of infection. Thiram (with or without mercury), captan or quinone were recommended for seed lots with less than 5% infection. Fungicides based on captan or quinone, but not thiram, were recommended for second treatment of already disinfected seed. F. Eng. s.—R.B.

343 Kien-Duong, D. Conséquences de mutilations expérimentales sur la croissance, l'anatomie, l'hydratation et la floraison de quelques espèces de lin. [**Effects of experimental mutilations on growth, anatomy, hydration and flowering of some species of flax.**] *Fibra* 1960, **5,** No. 2, 61–9, text in French and English. [Inst. Bot., Univ. Génève, Switzerland]

344 Čen'Mjan'-Da and Dospehov, B. A. [**Yield and quality of flax with prolonged use of fertilizers and liming.**] [Russian] (*Izv. Timirjazevsk. S-H. Akad.* (*Bull. Timirjazev agric. Acad.*) 1960, No. 3 (34), 65–84, bibl. 40, English summary.

The beneficial effects of P, K and mixed fertilizers (f.y.m. and NPK) are contrasted with the adverse effects of nitrogenous fertilizers on yield and quality of flax fibre. F. Eng. s.—M.H.

HEMP

345 Safra, R. **The control of *Orobanche* and wild oats in the USSR.** *Pest. Abstr.* (*C*) 1959, **5,** No. 2–3, 59–60.

The control of *Orobanche* sp. in hemp has been successfully resolved by growing the following

resistant hemp varieties: Južnaja Krasnodarskaja, Južnaja Pavlogradskaja and Južnaja Čerkasskaja. [See *Abs.* 356.]—E.B.O.

JUTE

346 FFRENCH-MULLEN, M. D. **Experiments in the cultivation, harvesting, and retting of jute in British Guiana. Pt 2.** *Trop. Sci.* 1960, **2**, No. 1–2, 1–35, bibl. 17, illus.

Large-scale trials were carried out in British Guiana during 1952–8 into the growing and processing of jute and the production of fibre. It was found that a variety from the Sudan and five selections from Brazil could be grown satisfactorily on certain soil types on the coastlands of British Guiana. The fibre from certain of these varieties was of high quality and could be spun into fine yarns. The cultivation, harvesting, retting, grading and baling of jute was satisfactorily mechanized by the development of specialized machinery and by the use of standard agricultural machinery, and suitable operating techniques were developed. It was not found possible to produce jute fibre at a cost to compete with fibre from Pakistan on the United Kingdom market. F. S.—A.G.G.H.

347 BAXTER, G. D. **The control of jute pests and diseases in British Guiana.** *Trop. Sci.* 1960, **2**, No. 1–2, 36–43, bibl. 13, illus. [Berbice Fibre Res. Co. Ltd., British Guiana]

KENAF

348 TOGLIANI, F. L'*Hibiscus cannabinus* nell'area risicola italiana. [***H. cannabinus* in the Italian rice area.**] *Riso* 1960, **9**, No. 4, 20–2, bibl. 2, illus.

Information, derived from the literature, is given on kenaf, which is now under trial in the rice districts of N. Italy. The area under rice has been reduced by about 30,000 ha during the past few years and kenaf is a possible new crop for this land.—E.B.O.

349 MCKINSTRY, A. H. **Gatooma Research Station. Kenaf spacing/fertilizer trial.** *Rep. Sec. Fed. Minist. Agric. Rhod. and Nyasald 1959* Salisbury, 1960, 87–8.

Kenaf (*Hibiscus cannabinus*) was sown in rows 6, 12 and 18 in. apart with 2 in. between rows on 11 Nov., 1958. Fertilizer treatments were : 0, 40 and 80 lb N/ac as sulphate of ammonia, 0, 30 and 60 lb P_2O_5/ac as superphosphate and 0, 30 and 60 lb K_2O/ac as muriate of potash. The mean greenweight yield for all treatments was 7·1 tons/ac. The 6-in. spacing yielded 7·9 tons/ac compared with 7·2 and 6·2 tons at the 12- and 18-in. spacing, respectively. Applications of N and P increased yields but K did not. Overall mean yield of "ribbons" was 671 lb/ac. This corresponded to a fibre percentage of only 4·7. "Ribbon" yields for the 6-, 12- and 18-in. spacing were 850, 675 and 390 lb/ac, respectively. Fertilizer treatments did not increase fibre weight in the same proportion as they did green weight.—S.M.J.

OIL CROPS

SESAME

350 MAZZANI, B. Variaciones del contenido en aceite de la semilla en cultivares locales de ajonjolí (*Sesamum indicum* L.). [**Variations of the oil content in the seed of local cultivars of sesame (*S. indicum*) (in Venezuela).**] *Agron. trop., Maracay* 1959, **9**, No. 1, 3–10, bibl. 11, English summary. [Centro Invest. Agron., Maracay, Venezuela]

A table gives the oil content in the seed of 7 sesame varieties grown in 3 localities in various years. The oil content was influenced more by locality and year of cultivation than by variety. The highest oil contents were obtained at the lowest altitude and the highest mean temperature.—E.B.O.

OIL-SEED FLAX

See also Abs. 368.

351 STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR, DENMARK. Kemisk bekæmpelse af alm. fuglegræs m. fl. i oliehør. [**The chemical control of *Stellaria media* in oil-seed flax.**] *Medd. 637 Stat. Forsøgsvirk. Plantekult.* 1960, pp. 2.

At 4 centres in Denmark during 1955–9, 15 trials were carried out on the control of *Stellaria media* in oil-seed flax. Plots received 0·7 kg dinoseb/ha (3 l of 20% dinoseb preparation) or 0·5 kg a.i. dinoseb + 0·5 kg a.i. MCPA/ha, applied at 500 l/ha when the flax was 4–8 cm high. These treatments resulted in increases in seed yield of 242 and 281 kg/ha for the 2 treatments, respectively, a decrease in straw yield and approx. 67% reduction in weed infestation. In 6 experiments the application of dinoseb + MCPA resulted in the largest yields of crude protein and oil. Practical recommendations are made.—S.M.J.

SAFFLOWER

352 NAIDU, N. B. **Safflower seed and oil : 1. Production in India. 2. Composition and utilization.** *Indian Oilseeds J.* 1960, **4**, No. 2, 62–9, bibl. 36; and 70–84, bibl. 78. [Reg. Res. Lab., Hyderabad]

These are review articles.—D.B.

SUNFLOWER

353 Lukašev, A. **[Lowering the pre-harvest moisture in seed of sunflower.]** [Russian] *Sel'sk. Sibiri* (*Agric. Siberia*) 1960, **5**, No. 1, 34–5.

In the Kulundinsk steppe [see *Fld Crop Abstr.* 6 : 1512] the weather is usually wet and cold at the time when sunflowers are ripening, with the result that the period of seed-filling is prolonged and at harvest the seed contains 20–25% moisture (compared with 16–18% in dry years). In 1955–8 tests were made in the Altaĭ Province to desiccate the seed of the standing crop. By cutting the heads (from 8 to 10 days after yellowing in 75% of the inflorescences) so that they are only partially attached to the stems, and subsequent combine-harvesting, the moisture content of the seed was reduced from 19% (control) to 12·6%.—M.H.

354 Nikolic-Vig, Vida. Nuove pregevoli varietà di girasole nell'U.R.S.S. **[New outstanding varieties of sunflower in the USSR.]** *Sementi elette* 1960, **6**, No. 2, 22–7, illus. [Inst. Agron. Res., Novi Sad, Yugoslavia]

The author, who studied the oil crops of the USSR during 6 months spent in that country, mainly at the Institute for Research on Oil Plants at Krasnodar, gives information on the new selected varieties of sunflower, which are resistant to *Orobanche cumana* and yield 3500–3800 kg seed/ha, and have an oil content of 43–51% (unshelled seeds).—E.B.O.

355 Obolensky, G. **Notes on the development of a commercial practical sunflower variety.** *Qual. Plant. et Materiae veg.* 1960, **7**, No. 1, 55–64, bibl. 10, French summary.

356 Safra, R. **The control of *Orobanche* and wild oats in the USSR.** *Pest. Abstr.* (*C*) 1959, **5**, No. 2–3, 59–60.

The control of *Orobanche* sp. in sunflower has been successfully resolved by growing the following resistant sunflower varieties : Ždanovskii 8281, VNIIMK 646, VNIIMK 8931, Anmavirskii 3497, Zelenka 63 and Zelenka 368. [See *Abs.* *345*.]—E.B.O.

RAPE

357† Bengtsson, A. Två skördar av samma höstrapsgröda ? **[Two crops from the same winter rape culture ?]** *Lantm. Svenskt Land* 1959, **70**, No. 47, 993–4.

Trials were conducted at the Ultuna Agricultural Experiment Station to determine whether winter rape [*Brassica napus* var. *oleifera* f. *biennis*] can be expected to give a green-fodder crop in the summer and a seed crop in the following year. Cutting the green-fodder crop in July, August and September, respectively, showed that successful regrowth and wintering depend upon the time of cutting. The stand cut in Aug. gave the best results, but even so, it compared unfavourably with the stand which had been sown at the normal time in Aug. and allowed to grow uncut through the winter. The use of winter rape in this way for 2 crops must be considered experimental as yet.—G.M.R.

358 Lindner, H. Ein Serienverfahren zur Bestimmung des Ackersenfbesatzes (*Sinapis arvensis* L.) im Saatgut von Brassica-Arten. **[A serial method for the determination of the adulteration of *Brassica* spp. seed with *Sinapis arvensis*.]** *Proc. internat. Seed Test. Ass.* 1959, **24**, No. 2, 168–78, bibl. 33, illus. [Inst. Agric. Res., Jena]

Under conditions of the tests which involve the use of ultra-violet light and paper chromatography, seed of *S. arvensis* is shown to contain a specific pigment, anthocyanin, and to emit a bright green-yellow fluorescence, while from seed of *Brassica napus*, *B. rapa* and *B. oleracea* there is no fluorescence.—M.H.

359 Fuji, S. and Okagaki, O. **Studies on the oil formation in rape seed. 4. On the effect of temperature.** [Japanese] *Proc. Crop Sci. Soc. Japan* 1960, **28**, No. 3, 301–4, bibl. 12, English summary. [Univ. Osaka Prefecture]

High temperature accelerated growth and development, hastened seed maturity and decreased the oil content of 3 varieties of rape. The decrease in oil content was less noticeable in Aburamasari (a variety having a high oil content) than in Norin No. 3 or Norin No. 14, in which the decreases were from 42 to 36% and 45 to 39%, respectively. F. Eng. s.—D.B.

POPPY

360 Nordestgård, A. Forsøg med sorter af opiatvalmue. 1948–58. **[Varietal trials with opium poppy (*Papaver somniferum*) 1948-58.]** *Tidsskr. Planteavl* 1960, **63**, No. 5, 848–55, English summary.

The *P. somniferum* vars. Svaløf Flora, Aarslev Luna and Mahndorfer were compared in trials in Denmark from 1948–58. Svaløf Flora and Aarslev Luna gave similar seed yields and nearly the same yields in crude fat and crude protein. Their average yields exceeded those of Mahndorfer for seed, crude fat and crude protein respectively by 6, 8 and 2–3%. F. s.—S.M.J.

361 Maas Geesteranus, H. P. Een geval van noodrijpheid bij blauwmaanzaad. **[A case of premature ripening in poppies.]** *Tijdschr.*

PlZiekt. 1960, **66**, No. 2, 107–10, illus., English summary. [Inst. PlZiektenk. Onderz., Wageningen, Netherlands]

Plots of poppy [*Papaver somniferum*] were sprayed with systox [demeton] on 29 May, 19 June and 6 July, 1959. A heavy infestation of *Aphis fabae* and *Myzus persicae* was present in the experimental field ; the final large flight of the latter took place on 6–8 July, when these plots had finished flowering, while other plots, surrounding those used in the spraying trial, were still in full bloom. On 17 July the unsprayed plots appeared completely dead, while the sprayed area remained entirely green, with sharply defined edges. The surrounding plots, which were at an earlier stage of development, did not die off prematurely. It was concluded that poppies in the early stages of seed-setting were probably more sensitive to aphid damage than those not setting seed. Seed yields from the unsprayed plots were reduced by 50%, owing to (a) a smaller number of capsules set per unit area, (b) seed failing to develop in some capsules, (c) lower 1000-seed weight. The fungus *Pyrenophora calvescens*, which is reputed to cause premature ripening, was equally abundant in both treated and untreated plots.—R.B.

MISCELLANEOUS CROPS

BUCKWHEAT

362 Usenko, V. V. [**Two harvests of buckwheat per annum.**] [Russian] *Zemledelie* (*Agriculture, USSR*) 1960, **8**, No. 6, 23–4. [Krasnodar Territory, Inspect. State Commission Var. Trials]

Long-term experiments in the Krasnodar region [45°N., 40°E.] have shown that *Fagopyrum esculentum* flourishes in the rice-growing areas of the lower Kuban river. During 1953–5, 1957 and 1959, sowings of buckwheat were made (on fallow in the rice rotation) each spring (11 – 28 April) and summer (26 July – 14 Aug.). The total grain yields (harvested 4 – 14 July and 25 Sept. – 16 Oct.) ranged from 2160 to 3740 kg/ha (average 2860 kg). It is estimated that the irrigated sowings of rice in rotations of the Kuban amount to 100,000 ha ; the fallow area is 15,000 ha. While other crops (maize, or vetch/oat mixture) may be used in the rice rotation, buckwheat is considered the best because it yields 2 grain harvests each year.—M.H.

KALE

See also Abs. 259, 358.

363† Connold, W. Q. and others. **Control of weeds in farm kale by spraying with sulphuric acid, sodium monochloroacetate, potassium cyanate and gas liquor (N.A.A.S. experiments 1956-57).** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 135–41, bibl. 2. [N.A.A.S., S.W. Region]

All the sprays used gave less crop damage and better weed control when applied to kale at the 3-true-leaf stage than at later stages. Sulphuric acid was the most generally effective spray against weeds in kale and the only one which was successful against *Chenopodium album* (fat hen). Potassium cyanate and SMCA were effective against *Polygonum persicaria* (redshank), *Sinapis arvensis* (yellow charlock) and *Brassica rapa* L. ssp. *campestris* (smooth-leaved charlock), provided that they were applied early. F. S.—A.M.H.

364† Hirst, R. H. and Martin, D. L. **Weed control in various fodder and vegetable crops with sodium monochloroacetate.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 131–4, bibl. 1. [Plant Protection Ltd., Fernhurst]

SMCA at 20–25 lb/ac controlled many weeds in kale without undue crop damage. The optimum stage for spraying was the 1- to 2-leaf stage in marrow-stemmed kale and the 2- to 3-leaf stage in thousand-headed kale. There was little to choose between high-, medium- and low-volume applications, but high-volume applications gave less consistent weed control than the others. Application of 20 gal/ac is recommended.—A.M.H.

365 Widdowson, F. V. and others. **The value of calcium nitrate and urea for main crop potatoes and kale.** *J. agric. Sci.* 1960, **55**, Pt 1, 1–10, bibl. 5. [Chem. Dep., Rothamsted Exp. Sta., Harpenden, Herts]

In 7 experiments with kale during 1955–8, calcium nitrate and ammonium sulphate were applied to the seedbeds before planting and their effects compared. Responses were obtained up to 2 cwt N/ac. Heavy seedbed dressings of calcium nitrate reduced plant numbers severely in the absence of adequate rainfall. In all other respects calcium nitrate and ammonium sulphate were roughly equivalent. Dressings applied partly to the seedbed and partly in mid-season gave slightly higher average yields of kale than an equivalent total amount of N applied before sowing. In experiments carried out during 1956–8, urea was applied to the seedbed at 1 and 2 cwt N/ac. Where the urea contained 4·5% biuret, germination was severely reduced but where the biuret content was $< 1\%$ there was generally little effect on germination and yields were similar to where ammonium sulphate was used.—S.M.J.

366 Hemingway, R. G. **Effects of salt and other fertilizers on yield and mineral composition of forage crops. 2. Kale.** *J. Sci. Fd Agric.* 1960, **11**, No. 7, 355–62, bibl. 5. [Agric. Chem. Dep., Univ. Glasgow]

CATTLE CABBAGE

367† Jones, D. J. C. **Studies of the effects of manuring and season on yield of cattle cabbage.** *J. Agric. Sci.* 1960, **55**, Pt 2, 165–73, bibl. 8. [Minist. Agric. Fish. Fd, Trawscoed, Aberystwyth]

Ten NPK manurial treatments [listed] were applied in each of 7 years to cattle cabbage [*Brassica oleracea*] grown in a 6-course rotation. Results are given of plots sampled 5 times at 2-weekly intervals in the last year. The dry-matter yields each year were related to the weather during the growing season. The application of N, P or K increased the content of these constitutents in the crop, but only P and K increased dry-matter yields. The application of P produced hearted plants which contained a lower percentage of dry matter than open-leaved plants produced in its absence.—S.M.J.

GENERAL

368 Soghaier, A. A. K. **Crop agronomy and improvement in Cyrenaica.** *Rep. 1111 FAO/ETAP* 1959, pp. 81. [Received April, 1960]

The agricultural background of crop agronomy in Cyrenaica is described. Most of the experimental studies carried out dealt with the improvement of staple food crops and development of cash crops. Wheat. Trials showed that the Jebel district is most suitable for the cultivation of durum wheats (*Triticum durum*) while the coastal plains and semi-desert areas are more suitable for soft wheats (*T. vulgare*). Selections from the local durum wheat Mokrabia were most suitable for cultivation in the Barce Plain and Hill Farms areas. In the coastal plains the varieties Canadian Soft and Florence Aurora maintained higher yields than local mixed varieties. Drought resistance, capacity to compete with noxious weeds, and tillering capacity appeared to be the main factors determining wheat yields in Cyrenaica. Results of fertilizer trials indicated that moisture was the major limiting factor to fertilizer effectiveness, but the soils were generally deficient in P, and to a lesser extent in N, while the K supply was adequate. In favourable years, applying fertilizer in rows with the seed was more effective than broadcasting before or after sowing. The optimum sowing date for wheat in the Jebel district was during the first half of Nov. Each week's delay in sowing after mid-Nov. caused a 10% reduction in grain yield. The optimum row spacing was 35 cm with a seed rate of 63 kg/ha. When wheat was grazed by sheep to a height of about 10 cm in mid-Jan., or at the 5th leaf stage, yields were increased by about 20%. Barley. The optimum sowing rate in the coastal plains and semi-desert areas was 40–48 kg/ha, in rows 20 cm apart. The local barley gave good yields under most conditions throughout the province, but was inferior to a few imported varieties under rainfed conditions in the semi-desert and coastal areas. The var. Athenais imported from Cyprus outyielded the local barley and was more drought resistant. It is also recommended for forage production because of its resistance to drought. In general, barley showed greater responses to fertilizer than did wheat. N and P were both required in dry farming and were the factors limiting yield. Optimum dressings depended on rainfall. Application of K was ineffective in all the barley-growing area. Linseed. The Sicilian var. Altamura was the most successful. Grain legumes. Black-Eye Susan peas gave the highest yields of grain and straw in the Jebel area, and was followed by Conserve. Cyprus lentils grew as well as peas if sown in late Feb. Chickpeas var. Cyprus outyielded local varieties by about 100%. Potatoes. Only limited areas of the Jebel district were suitable for potato cultivation, and in these areas only one crop per year, planted in early spring, was possible. The most promising varieties were Bintje, Ari and Voran. Urgenta, Profijt and Voran were most suitable in the coastal gardens around Benghazi.—A.M.H.

369 Thomas, Jacqueline, M. C. Sur quelques plantes cultivées chez les Ngbaka de la Lobaye (République Centrafricaine). [**On some plants cultivated by the Ngbaka of Lobaye (Central-African Republic).**] *Bull. Inst. centrafr.* 1960, No. 19–20, 5–43, bibl. 46.

Information is given on the following crops, among others : yam (*Dioscorea* sp.), cocoyam (*Colocasia esculenta*), sesame (*Sesamum indicum*), maize, groundnuts and rice.—E.B.O.

CROP BOTANY

METABOLISM AND PLANT CHEMISTRY

See also Abs. 181.

370 Asana, R. D. **Investigations on water relations of some Indian crop plants—a review.** *Bull. Res. Coun. Israel (D)* 1960, 8, No. 3–4, 97–104, bibl. 39. [Ind. Agric. Res. Inst., New Delhi]

A review is presented of recent work on the water relations and drought resistance of crops which include rice, *Sorghum vulgare*, wheat and cotton.—G.M.R.

371† Slatyer, R. O. and Taylor, S. A. **Terminology in plant- and soil-water relations.** *Nature, Lond.* 1960, **187,** No. 4741, 922–4, bibl. 19. [CSIRO, Canberra (R.O.S.) and Utah State Univ., Logan, (S.A.T.)]

At a recent symposium on plant/water relations in arid regions organized by UNESCO at Madrid, the terminology currently used in this field was the subject of a special discussion, the main points of which are summarized in these notes, under 9 sections.—M.H.

372† Puustjärvi, V. **On the pH requirements of various plants in different soils from the viewpoint of the mechanism of cation uptake of the plants.** *Acta Agric. scand.* 1959, **9,** No. 4, 390–402, bibl. 7.

Barley, rye, oats, wheat and clover were included in the investigation.—S.M.J.

373† Dragone-Testi, G. Utilizzazione diretta di amminoacidi da parte di piante verdi. **[Direct utilization of amino acids by green plants.]** *Ann. Bot., Roma* 1958, **26,** No. 1, 106–16, bibl. 18, English summary. [Ist. Bot., Roma]

The results from pot trials showed that seedlings of *Lupinus luteus*, grown under sterile conditions, absorbed N from asparagine supplied instead of calcium nitrate in the nutrient solution.—E.B.O.

374 Dundas, J. **Sodium for world crops. Survey of investigations in Europe and America.** *World Crops* 1960, **12,** No. 6, 225–7, bibl. 18, illus.

The effect of Na on sugar-beet and cotton is included.—S.M.J.

375 Böszörményi, Z. and Cseh, Edith. **The uptake and reduction of iodate by wheat-roots.** *Curr. Sci.* 1960, **29,** No. 9, 340–1, bibl. 2, illus. [Inst. Pl. Physiol. and Centr. Biol. Isotope Lab., Eötvös Univ., Budapest, Hungary]

This is a contribution towards the study of the toxicity of halogen anions.—D.B.

376† Škol'nik, M. Ja. **The physiological role of micro-nutrients in plants.** [Russian] *Izv. Akad. Nauk SSSR (Bull. Acad. Sci. USSR)* Biol. Ser. 1960, No. 5, 686–706, bibl. 168, English summary. [V.L. Komarov Bot. Inst., Acad. Sci. USSR, Leningrad]

A review of the world literature on this subject is given, with special reference to enzymes containing Fe and Cu as well as to the effect of micronutrients in different enzyme systems. There are details of recent research on micro-nutrient participation in flavoprotein catalysis. In view of new findings concerning metal/organic compounds and metal-containing enzymes, a new approach to the problem of ion antagonism is suggested. The paper discusses the role of micronutrients (especially that of Mn) in photosynthesis and in chlorophyll synthesis as well as in carbohydrate, phosphorus and protein metabolism and in translocation of organic substances. Attention is paid to the effects of micronutrients upon growth and reproduction of plants and upon their resistance to unfavourable environments and to diseases. F. S.—M.H.

377 Bönig, G. and Heigener, H. Ertragssteigerung in Gefässversuchen durch Saatgutbehandlung mit Mikronährstofflösungen. **[Yield increase by seed treatment with micronutrient solutions (pot experiments).]** *Landw. Forsch.* 1960, **13,** No. 1, 59–61, bibl. 22, English and French summaries. [Landw. Untersuch- u. Forschungsanstalt, Kiel, Fed. Rep. Germany]

In 3-yr pot experiments it was shown that soaking seeds (spring barley and buckwheat) in micro-nutrient solutions ($CuSO_4$, $ZnSO_4$, $CoSO_4$) can overcome the lack of micronutrients in sandy soils. Up to 11% yield increases on such soils were recorded.—D.B.

378 Godnev, T. N. and Lipskaja, G. A. **[The effect of different methods of applying micro-elements on chloroplast size and accumulation of chlorophyll in leaves of sugar-beet.]** [Russian] *Izv. Akad. Nauk Beloruss. SSR* Ser. Biol. (*Bull. Acad. Sci. White Russia SSR*) 1960, No. 2, 130–2, bibl. 7.

The methods (each with 3 replications) were : (1) soaking the seed for 24 hr in a solution containing Cu, Mn, B (each 0·05% concentration), Mo, Co, Ni, and Zn (each 0·01%) ; (2) spraying the plants with the solution after the appearance of the 3rd leaf (not counting seed-leaves) ; and (3) applying the solution to the soil in which the plants were growing. The size of the chloroplasts was determined (using an immersion lens) according to the formula $4/3\ \pi$ abc, where a, b and c are the [lengths of the] semi-axes of the chloroplasts. Chlorophyll was extracted by means of acetone and studied spectrophotometrically. The data show that the micro-elements increase the size of the chloroplasts and increase the amount of chlorophyll in the leaves, the greatest increases being attained by treatment (1), when the chloroplasts measured $65\mu^3$ compared with $45\mu^3$ in the control.—M.H.

379† Bray, J. R. **The chlorophyll content of some native and managed plant communities in central Minnesota.** *Canad. J. Bot.* 1960, **38,** No. 3, 313–33, bibl. 16. [Bot. Dep., Univ. Toronto]

380 Thorne, Gillian N. **Variations with age in net assimilation rate and other growth attributes of sugar-beet, potato and**

barley in a controlled environment. *Ann. Bot., Lond.* 1960, **24**, No. 95, 356–71, bibl. 14. [Rothamsted Exp. Sta., Harpenden, Herts]

The plants were grown in a controlled environment, for periods of up to 10 weeks from sowing, with a light intensity of 1800 f.c. (4·9 cal/cm²/hr) and a temperature of 20°C during the 18–hour photoperiod and 15°C during the dark period, to test whether net assimilation rate varied with age and differed between the 3 species. Net assimilation rate of all species based on leaf area (E_a) fell approximately linearly with time. During 5 weeks E_a of sugar-beet decreased by about only 20% and E_a of potato decreased by 50%. E_a of barley remained approximately constant for 4 weeks after sowing and was halved during the subsequent 4 weeks. The average value of E_a for all times [time intervals] was greatest for sugar-beet and least for barley. Net assimilation rates based on leaf weight (E_w) and leaf N (E_n) decreased at about 15% of the initial value per week for all species ; this was similar to the mean rate of decrease for E_a of potato and barley, but greater than that for E_a of sugar-beet. Mean values of E_w and E_n for potato and barley were similar, but were less than those of sugar-beet. Relative growth rate (R_w), relative leaf growth-rate (R_a) and leaf-area ratio (F) fell with time at similar rates for all species. Average values for R_w decreased and of F increased in the order sugar-beet, potato, barley. R_a was greatest for potato and least for barley. F. s.—M.H.

381† Wilson, J. W. **Observations on net assimilation rates in Arctic environments.** *Ann. Bot., Lond.* 1960, **24**, No. 95, 372–81, bibl. 17. [Bot. Dep., Univ. Reading]

Examination of the net assimilation rate (E) during the growing season in arctic regions by a detached-leaf method revealed no differences between species or with soil richness, but showed a reduction of E with exposure to wind (probably resulting from cooling) and a tendency for E to fall towards the later part of the growing season. E generally lay in the range 0·5 to 0·8 g/dm²/week. E for detached leaves is not comparable with E for whole plants ; E for detached leaves in temperate summer conditions is normally around 1·1 to 1·5 g/dm²/week. Thus E is reduced in arctic environments to about half its value in temperate conditions. This reduction is due mainly to cold. F. s.—M.H.

382 Baljura, V. I. [**Leaf area and density of the plant stand.**] [Russian] *Kukuruza* (*Maize, USSR*) 1960, **5**, No. 6, 39–42.

In the non-chernozem zone there are large areas sown with the southern, late-ripening varieties of maize (Sterling, Krasnodar 1/49 and VIR 42). Early varieties (Voronežskaja 76 and 80), while producing higher yields of cobs, are not widely used. In most cases varieties with different rates of ripening are sown at the same rate per ha, although the plants differ in growth vigour and leaf area. Consequently the potential yield, especially of the early varieties, is not manifest. It is claimed that the criterion by which the optimal density of the stand can be determined is the extent of the leaf area. As 90–95% of the dry matter is composed of organic substances manufactured by photosynthesis of the leaves, the dry-matter harvest depends on (i) leaf area/ha and (ii) the duration of the photosynthetic function. The average leaf area [of grain crops] per ha of sowing is 30–40 thousand sq. m. In wheat, for example, the leaf area of one plant is 100 times less than that of maize, although the number of plants per ha is about 100 times greater. To obtain data on yields of varieties which differ in their rate of ripening, the crops should be grown under uniform conditions, including a uniform area of nutrition and leaf-surface per ha. Ničiporovič [no literature cited] has maintained that leaves of different plants in unit time accumulate a uniform amount of organic substance, i.e. 4–5 g/day/sq. m leaf area. It should, however, be stressed that the duration of the leaf's activity in different plants is not uniform, and therefore at the end of the vegetative period different plants may accumulate different amounts of organic matter. In the non-chernozem zone, a uniform productivity in maize leaves of varieties which ripen at different rates is observed only when productivity is determined at one and the same phase of development ; and in this zone at harvest time the varieties which differ in the length of their vegetative period are at different developmental phases. For example, between 2–8 Sept., 1959, the maize variety Voronežskaja 80 (early) with an average of 13·2 leaves per plant at milk ripeness, had a leaf area of 2676 sq. cm, productivity of the leaves being 27 g/sq. dm ; while Krasnodarskaja 4 (late) with an average of 17·3 leaves per plant at flowering, had a leaf area of 6716 sq. cm, productivity of the leaves being 15 g/sq. dm. Thus, early varieties in the non-chernozem zone have their maximum leaf productivity at wax/full ripeness. The later the ripening of any variety, the earlier is the developmental phase at harvesting time and consequently the less the leaf productivity. This is confirmed by the author's calculations of (1) dry matter (5 varieties) obtained in 1957 ; and (2) varietal trials in 1959 in which yields were calculated per plant and per ha. Finally, to ascertain why early varieties of maize surpass late varieties in leaf productivity, observations were made in 1959 on the dynamics of leaf growth and plant weight in 3 varieties which differed in the length of their vegetative period. It is claimed that if the working time of 1 sq. dm of leaf surface for the extremely early var. Sibirjačka = 100, then for the medium-

ripening Nemčinovskaja the time is 67, and 36 for the very late variety Odesskaja. This difference in the intensity and duration of leaf working would result in the harvest per sq. dm of leaf surface being 30 g green mass for Sibirjačka, 24 g for Nemčinovskaja and 13 for Odesskaja. The author concludes that increasing the productivity of the leaves in early maize varieties would be a major factor in raising yields in the non-chernozem zone if the crops are grown in a stand density optimal for the variety concerned. It is therefore necessary to determine the sowing rate which is optimum for each sub-zone and variety separately. [See also *Fld Crop Abstr.* 13 : pp. 169–75.]—M.H.

383 Avundžjan, E. S. [**Changes in the composition of free amino acids in the roots and sap of *Polygonum orientale* according to phase of development.**] [Russian] *Izv. Akad. Nauk Armjansk. SSR* 1960, **13**, No. 2, 3–16, bibl. 13, illus. Armenian summary.

The tests were made by cutting the plants above the root neck at different stages of ontogenesis and analysing the exuding sap by means of paper chromatography. Amino acids are the products of metabolism in the absorbing and translocating tissues of the root. The maximum number of amino-acids (14) was found in the sap when the plant was at the flowering stage, and the minimum number (2) at leaf yellowing. The composition of the acids changes with the lapse of time after taking the sap from the root ; the maximum number of the acids occurred in the root on the 1st or 2nd day after cutting and in the exuded sap in the 2nd or 3rd day after cutting. Asparaginic [aspartic] and glutaminic [glutamic] acids and α-alanine are always found in the roots and sap of *P. orientale*, irrespective of plant growth phase and time of sampling.—M.H.

384† Birecka, H. and others. **Alkaloid synthesis in derooted white lupin plants.** *Bull. Acad. polon. Sci.* 1960, **8**, No. 5, 167–73, bibl. 9. [Coll. Agric., Warsaw, and Inst. Soil Management and Fertilization, Warsaw]

385† Birecka, H. and Sebyła, T. **Transformations of C-labelled lupanine in white lupin.** *Bull. Acad. polon. Sci.* 1960, **8**, No. 5, 183–8, bibl. 4. [Coll. Agric. Warsaw]

386 Moffatt, J. S. and Radley, Margaret. **Gibberellic acid. 11. The growth-promoting activities of some functional derivatives of gibberellic acid [in peas].** *J. Sci. Fd Agric.* 1960, **11**, No. 7, 386–90, bibl. 7. [ICI, Akers Res. Labs, Welwyn, Herts]

387 Key, J. L. **Some biochemical effects of 2,4-dichlorophenoxyacetic acid on plants.** *Diss. Abstr.* 1960, **20**, No. 9, 3050–1. [Univ. Illinois, Urbana]

The results are given of studies of the physiological and biochemical responses of soyabean seedlings to 2,4-D.—P.J.B.

388 Kuc, J. **A biochemical study of the nature of disease resistance in plants.** *Diss. Abstr.* 1960, **20**, No. 11, 4260–1. [Purdue Univ., Lafayette, Indiana]

Caffeic acid and chlorogenic acid were present in the skin of potato tubers and were found to inhibit growth of *Helminthosporium carbonum* (a fungus causing leaf spot in maize). Other compounds in potato tissue, such as cysteine, did not themselves inhibit fungal growth but increased the toxicity of caffeic and chlorogenic acid. Where the tuber skin was damaged, adjacent pulp tissue produced inhibitory substances around points of infection. *Sclerotium rolfsii* and *Fusarium solani* stimulated potato tissue to produce compounds capable of inhibiting growth of *H. carbonum* but not that of the potato pathogens. In maize, some varieties of which were hosts of *H. carbonum*, no inhibitors were present in tissue not attacked by this fungus, but infection induced the production of inhibitory substances in greater concentration in resistant- than in susceptible-varieties.—R.B.

389 Mace, M. E. **Naturally occurring quinones in wheat and barley and their toxicity to loose smut fungi.** *Diss. Abstr.* 1960, **20**, No. 11, 4237–8. [N. Carolina State Coll., Raleigh]

In tests with *Ustilago nuda* and *U. tritici*, 2-methoxyquinol, 2-methoxy-p-benzoquinone and 2,6-dimethoxy-p-benzoquinone were highly toxic to both spores and mycelia ; the last-named compound was least toxic. Between 22·2 and 28·1% of the 2-methoxyquinol glucoside present in wheat and barley embryos was lost during anaerobic or long water-soak treatment. Colorimetric tests indicated that the glucoside was reduced during these treatments to form free 2-methoxyquinol. If this compound or its oxidation product, 2-methoxy-p-benzoquinone, were to accumulate in the embryo during treatment, in amounts equivalent to the decrease in the concentration of its glucoside, its concentration would be greatly in excess of that required to kill the fungal mycelium *in vitro*. Paper chromatography of treated wheat and barley grain failed to detect the presence of any of the 3 compounds.—R.B.

390 Grodzinskiĭ, A. M. and others. **Germination inhibitor from the fruits of *Crambe tatarica* Sebeök.** [Ukrainian] *Ukr. bot. Ž. Kiev (Ukrainian bot. J.)* 1960, **17**, No. 1, 29–39, bibl. 28, Russian and English summaries.

The seeds and fruit husks of this species contain a substance which inhibits seed germination of various plants. The inhibitor is readily soluble in

water, resistant to frost, boiling, and drying at 105°C. The substance is practically unabsorbed by soils in the habitat of *C. tatarica*. If it is diluted 1000–10,000 times, the inhibition becomes transformed to a stimulus. It is suggested that the biological role of the inhibitor is to maintain a period of dormancy in *Crambe* seeds and to provide room for the seedlings by depressing growth of the neighbouring plants. F. s.—M.H.

ENVIRONMENT

391† Levitt, J. and others. **Some problems in drought resistance.** *Bull. Res. Coun. Israel* (*D*) 1960, **8**, No. 3–4, 173–80, bibl. 5. [Univ. Missouri]

A terminology is suggested for removing some misunderstandings. In the several plants tested, drought avoidance [e.g. the ability to mature before the onset of the severest drought] was always found to be the reason for drought resistance, except when frost hardening resulted in drought resistance, which proved to be tolerance. A scheme is proposed for testing plants in order to determine whether their drought resistance is due to drought avoidance or tolerance. A simple chamber for measuring drought resistance is described. F. s.—G.M.R.

392 Wadsworth, R. M. **The effect of artificial wind on the growth-rate of plants in water culture.** *Ann. bot., Lond.* 1960, **24**, No. 94, 200–11, bibl. 21, illus. [Bot. Dep., Univ. Reading]

Young plants of *Brassica napus* (rape), *Hordeum vulgare*, and *Pisum sativum* growing in water culture were exposed to 4 continuous wind speeds for from 4 to 5 days. The plants were exposed to natural daylight, humidity, and temperature in a wind tunnel in which only air movement was controlled. The wind speeds among the plants in the 4 sections of the tunnel were approximately 0·3, 0·7, 1·7 and 4·0 m/sec. The results showed no significant change in relative growth-rate or net assimilation rate with wind speed. Previously published results, obtained with plants in soil or sand culture, have shown a fall in the amount of growth as wind speed increased. It is suggested that this fall was caused by partial drying of the plants, while in the present experiments water-supply to the roots was abundant and the drying effect was considerably reduced. F. s.—M.H.

393 Lyles, L. and Woodruff, N. P. **Abrasive action of windblown soil on plant seedlings.** *Agron. J.* 1960, **52**, No. 9, 533–6, bibl. 8, illus. [Western Soil and Water Mgmt Res. Br. USDA, Manhattan, Kansas]

394 Goodall, D. W. **Quantitative effects of intraspecific competition : an experiment with mangolds.** *Bull. Res. Coun. Israel* (*D*) 1960, **8**, No. 3–4, 181–94, bibl. 29. [Univ. Reading]

In a field trial with *Beta vulgaris*, the effects of individual competitors spaced evenly around an experimental plant on the logarithm of its root weight were additive, provided the number of competitors did not exceed 6. The effect of a given number of competitors placed at different distances on root weight is expressed by an equation of the Mitscherlich type ; or by a " power equation ". The " reciprocal equation " based on a logistic growth curve gave rather less satisfactory agreement. F. s.—G.M.R.

395† Steubing, L. Wurzeluntersuchungen an Feldschutzhecken. [**Investigations of roots of field hedges.**] *Z. Acker- u. PflBau* 1960, **110**, No. 3, 332–41, bibl. 24, illus., English summary. [Bot. Inst., Univ. Giessen, W. Germany and Pflanzenökologisches Lab., Potsdam-Sanssouci, E. Germany]

Root spread was studied in various hedge plants used as field fences in the neighbourhood of Potsdam. The spread of roots into a field caused a reduction in growth of crop plants. This effect was less marked in the case of hedge plants with intensive, surface roots (*Euonymus europaea*, *Syringa vulgaris*, *Corylus avellana*, *Ligustrum vulgare*) than those with extensive, deep root systems (*Populus alba*, *Sambucus nigra*). When a trench (enriched with leaf mould) separated the hedge from the field crops the roots of the hedge plants tended to bend along the trench instead of extending into the field.—D.B.

PHASIC DEVELOPMENT

396 Mehanik, F. Ja. [**The effect of mineral and organic substances on the passing of the vernalization phase in plants.**] [Russian] *Agrobiologija* (*Agrobiology, Moscow*) 1960, No. 3 (123), 440–2, bibl. 14. [Beloruss, Agric. Acad., Gorki, Mogilev Province]

397 Stroun, M. and others. La vernalisation, le photopériodostade et la résistance au froid des blés. [**Vernalization, photoperiodic phase and resistance to cold in wheat.**] *Phyton* 1960, **14**, No. 2, 121–6, bibl. 5. [Inst. Bot. Univ. Génève, Switzerland]

The object of this investigation, carried out with 6 varieties of soft wheat, winter type, which have different degrees of resistance to cold, was to study the relationship between duration of vernalization and rate of differentiation of flower primordia which is dependent on the photoperiodic processes ; the resistance to cold was also related to these phenomena. The wheat seeds were subjected to vernalization treatment (2° – 5°C) for

periods varying from 15 to 50 days. It was found that the shorter the period of vernalization treatment, the longer was the time required for the wheat primordia to differentiate. For instance, the var. Probus, subjected to vernalization for 25 days, reached stage II (segmentation of the growth cone) in 59 days,while this stage was reached in 22 days after vernalization for 50 days. This would indicate that vernalization can be completed at a high temperature. When vernalization takes place entirely at a low temperature, further differentiation of the primordia takes place more rapidly than when vernalization is completed at a high temperature. Of the varieties tested, Cappelle is considered the most susceptible to cold as it reached stage II in the shortest time (36 days) with a vernalization treatment of 19 days. The varieties Heine VII and Carsten VIII were the most resistant to cold. [See also *Fld Crop Abstr.* 12 : 1796.]—E.B.O.

RADIOBIOLOGY

398 Middleton, L. J. **Radioactive strontium and caesium in the edible parts of crop plants after foliar contamination.** *Internat. J. Rad. Biol.* 1959, **4,** 387–402. [Agric. Res. Coun., Grove, Berkshire, and Fld Sta., Compton, Berkshire]

The degree of contamination of wheat, potato, cabbage, and sugar-beet was investigated after the application of ^{89}Sr and ^{137}Cs in a fine spray at different stages in the growth of the plants. The main experimental treatments were applied over 2 years to obtain information on seasonal effects. The extent to which ^{137}Cs was concentrated in the edible tissues greatly exceeded that of ^{89}Sr. Usually the concentration of ^{89}Sr or ^{137}Cs in each crop varied by less than an order of magnitude irrespective of the stage of growth of the crop at the time of contamination and the year in which the experiment was carried out ; the ^{89}Sr content of wheat grain, however, was considerably lower when the plants were contaminated before the ears emerged. A large part of the radioactivity which was deposited on the leaves was removed rapidly by rain ; a further fraction was lost as leaves died. The data obtained have been used to predict the probable degree of contamination of crops growing under normal agricultural conditions. From *Nuclear Sci. Abstr.* 1960, **14,** No. 6A, 639.—R.B.

399† Mayneord, W. V. and others. **Alpha activity of certain botanical materials.** *Nature, Lond.* 1960, **187,** No. 4733, 208–11, bibl. 8. [Phys. Dep., Royal Cancer Hosp., London, S.W.3.]

This study of soils from Central Africa and various parts of Gt Britain, and of grass [species not mentioned] from Gt Britain, together with certain tropical crops which include cotton, was made to determine the nature and present levels of naturally occurring radioactivity in man and his environment.—M.H.

TECHNIQUES AND APPARATUS

See also Abs. 47.

400 Kamra, S. K. **The effect of treatment with absolute alcohol on seeds of different species.** *Indian J. Pl. Physiol.* 1959, **2,** No. 2, 132–40, bibl. 11. [Seed Testing Sta., Münster i.W., German Fed. Rep.]

To test the permeability of the seed coat to toxic substances, seeds of *Secale cereale*, *Lens esculentum*, *Brassica rapa* and *Pisum sativum* (amongst others) were dried to a uniform water content of 5–7%, treated with absolute alcohol for varying periods and, after determining water content, were allowed to germinate. The relationships were studied between (a) germination capacity and duration of alcohol treatment ; (b) duration of alcohol treatment and water content of seeds ; (c) water content of alcohol-treated seeds and germination capacity. Seeds of *S. cereale* and *L. esculentum* [*L. culinaris*], in which germination was reduced, were the most sensitive to alcohol treatment ; *P. sativum* was the most resistant.—D.B.

401† Kmoch, H. G. Die Herstellung von Wurzelprofilen mit Hilfe des UTAH-Erdbohrers und ihre Ausdeutung. 1. Mitteilung : Methodik der Wurzelprofil-Herstellung. [**The production of root profiles with the help of the Utah soil sampling machine and their interpretation. 1. Method of making root profiles.**] *Z. Acker- u. PflBau* 1960, **110,** No. 3, 249–54, bibl. 5, illus. [Inst. PflBau, Univ. Bonn, W. Germany]

402† Kmoch, H. G. Die Herstellung von Wurzelprofilen mit Hilfe des UTAH-Erdbohrers und ihre Ausdeutung. [**The preparation of root profiles with the help of the UTAH soil borer and their interpretation.**] *Z. Acker- u. PflBau* 1960, **110,** No. 4, 425–37, bibl. 8, illus., English summary. [Inst. PflBau, Univ. Bonn, German Fed. Rep.]

This soil-boring machine was used at Dikopshof, near Bonn, to obtain entire soil profiles which could provide a representative and standard series of root patterns under given conditions of growth. Samples were taken 4 times during the growing season from a field of wheat growing on a para-brown soil. The pattern of root growth revealed differences in soil structure. For example, in a relatively homogeneous soil, a zone of perpendicular roots below and above a zone of branched roots revealed that there were differences in soil structure which were not formerly apparent. Flat

objects in the top soil did not act as permanent obstacles to the downward growth of roots, but the frontier between top soil and subsoil did provide an obstacle. Depth of penetration depended on soil moisture. F. Ger. s.—D.B.

403† Holmes, R. M. and Robertson, G. W. **Soil heaving in alfalfa plots in relation to soil and air temperature.** *Canad. J. Soil Sci.* 1960, **40**, No. 2, 212–18, bibl. 7, illus. [Canada Dep. Agric., Ottawa, Ontario]

Apparatus for measuring soil frost-heaving is described and illustrated. In experiments during the winters of 1957–8, soil-heaving to a height of 5 cm was recorded on 15 March 1958, but no damage was caused to lucerne plants. [See *Herb. Abstr.* 28 : 1309.]—R.B.

404† Sivadjian, J. Sur le dosage hygrophotographique de la transpiration végétale. [**On the hygrophotographic determination of transpiration in plants.**] *Bull. Soc. bot. Fr.* 1960, **107**, No. 1–2, 4–7, bibl. 2, illus.

Improvements in this method are described. [See also *Fld Crop Abstr.* 13 : 1232.]—E.B.O.

405† Nuernbergk, E. L. Die Technik der Kunstlichtbeleuchtung. [**The technique of artificial illumination.**] *Angew. Bot.* 1959, **33**, No. 2, 71–92, bibl. 25. [Staatsinst. f. Allgemeine Botanik, Hamburg]

This review covers : the purposes for which artificial illumination is used ; the nature and sources of supplementary illumination ; installation of lamps ; time, duration and intensity of illumination ; moving lamps (to approach the condition in nature) ; and the effect of intermittent illumination on plant physiology.—D.B.

406† Carpenter, G. A. and Moulsley, L. J. **The artificial illumination of environmental control chambers for plant growth.** *J. agric. Engng Res.* 1960, **5**, No. 3, 283–305, bibl. 40, illus. [NIAE, Silsoe, Beds]

The factors are discussed which affect the spatial distribution of light intensity, control of light intensity with time, and the maximum obtainable light intensity in a cubical cabinet illuminated by fluorescent tubes. A method is described for controlling the temperature of the tubes by forced cooling. F. s.—S.M.J.

407† Oda, Y. and others. **The air-conditioned darkroom with artificial light (growth-chamber) in the Institute for Agricultural Research, Tohoku University.** *Sci. Reps Res. Inst. Tohoku (D)* 1960, **11**, No. 1, 31–57, bibl. 3, illus.

A description is given of the construction and operation of the chamber, the temperature and humidity of which can be kept constant or varied according to any desired pattern. Experimental plants can be grown to maturity under light intensities which can be varied between 2000 and 12,000 lux. Daylengths, each consisting of a light and a dark period, can be controlled automatically. —A.G.G.H.

408† Pienaar, W. J. **A direct reading spectrochemical method for the analysis of plant material.** *S. Afr. J. agric. Sci.* 1960, **3**, No. 1, 57–68, bibl. 15. [Western Province Fruit Res. Sta., Stellenbosch, S. Africa]

409† Sinskaja, E. N. and Borkovskaja, V. A. [**Methods for the analysis of plant populations.**] [Russian] *Bjull. Moskov. Obšč. Ispyt. Prirody, Ot. Biol.* (*Bull. Moscow Soc. Naturalists, Biol. Div.*) 1960, **65**, No. 1, 77–89, bibl. 12, illus.

The observations are based mainly on winter wheats grown from late spring sowings in different regions, viz. Puškin, Sverdlovsk, the Kuban, and 2 areas (at 300 and 600 m) in north-west Caucasia. It is maintained that analysis should incorporate data showing the effects on a plant population of factors such as continuous day and high temperatures under which a spring/winter type of crop would develop.—M.H.

410† Schnell, R. Techniques d'herborisation et de conservation des plantes dans les pays tropicaux. [**Techniques for botanizing and preserving plants in tropical countries.**] *J. Agric. trop. et Bot. appl.* 1960, **7**, No. 1–3, 1–48, bibl. 22, illus.

This article is concerned with the collection and drying of plant specimens, their preservation in transit, in a herbarium, or in liquids. The collection and preservation of living plants is also described. —E.B.O.

WEEDS AND WEED CONTROL

Where weeds are specific to a crop, see under the crop concerned.

411† Osvald, H. [Ed.] " Ogräsforskningen " vid Institutionen för växtodlingslära 1952–1958. [**Investigations on weed problems 1952-8.**] *Växtodling, Uppsala* 1959, No. 10, pp. 244. [Dept Pl. Husb., Royal Sch. Agric., Sweden]

This collection of 20 papers on weed problems includes the following : Competition between weeds and cultivated plants, by B. Granström ; Experiments with IPC and calcium cyanamide against *Avena fatua*, by M. Hahlin ; Chemicals against wild oats, by H. Wiberg ; Various methods against *Avena fatua* in a crop rotation experiment (1), by E. Åberg ; Viability of wild-oat kernels in a compost, by H. Wiberg ; Effect of chlorinated phenoxyacetic acids on vegetative development, seed formation and germination biology of wild oats, by A. Aamisepp ; Wild onions as weeds in S.E. Sweden, by S. Håkansson ; Germination biology of *Galium aparine*, by S. Sjöstedt ; 2,4-D for controlling *Taraxacum officinalis* in permanent pastures, by K. Svensson ; Effect of chlorinated phenoxyacetic acids and dinitro-butylphenols on *Galium mollugo* in seed production fields of *Phleum pratense*, by E. Åberg ; *Rhinanthus serotinus* and its chemical control, by S. Håkansson; Spraying with sodium arsenite against weeds in rape, by A. Bengtsson and K. Walther ; Effect of chlorinated phenoxyacetic acids on quality characteristics in cereals and linseed, by E. Åberg.—D.B.

412† Hattingh, E. R. **Survey of certain weed control problems in Africa south of the Sahara.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4,** 215–24, bibl. 23. [African Explosives and Chemical Ind., Ltd., Johannesburg]

The vegetation types found in Africa south of the Sahara are briefly described and the general problems in tropical weed control discussed. Certain major problems are reviewed under the heads : bush control in natural grazing ; weed control in maize, chiefly by pre-emergence treatments ; control of aquatic weeds, chiefly water hyacinth (*Eichhornia crassipes*).—A.M.H.

413† Rambo, B. Die Europäischen Unkräuter in Südbrasilien. [**European weeds in south Brazil.**] *Sellowia* 1960, **12,** No. 12, 45–78, bibl. 3, English and Portuguese summaries.

Information is given on the European weeds present in Rio Grande do Sul ; of the 95 species present less than 10 are noxious. F. S.—E.B.O.

414† Sant, M. V. and Gokhale, A. V. **Control of some common weeds.** *Poona Agric. Coll. Mag.* 1960, **51,** No. 1, 21–7.

The paper consists of tabulated data on 35 weeds of field crops, grassland and waste land, all in the neighbourhood of Poona. Botanical and common names, habitat, a brief botanical description and control measures (cultural and chemical) are given.—D.B.

415† Rademacher, B. Traditionelle und moderne Verfahren in der Unkrautbekämpfung. [**Traditional and modern methods of weed control.**] *Schweiz. landw. MH.* 1960, **38,** No. 4, 159–88, bibl. 32, illus. [Landw. Hochsch. Hohenheim, Stuttgart, W. Germany]

416† Woodford, E. K. and Kasasian, L. **Some new herbicides : developments in chemical weed control 1958-60.** *Chem. and Industr.* 1960, No. 36, 1118–25, bibl. 30. [A.R.C. Weed Res. Org., Univ. Oxford]

Information is given on the effectiveness of new herbicides against particular weeds.—E.B.O.

417 Jahn-Deesbach, W. and Vogt, M. Untersuchungen über die Unkrautflora im langjährigen Nährstoffmangelversuch Thyrow bei Berlin. [**An investigation on weed flora in a long-term nutrient-deficiency trial at Thyrow near Berlin.**] *Z. Acker- u. PflBau* 1960, **110,** No. 2, 216–29, bibl 13, illus. [Inst. Acker- u. PflBau, Humboldt Univ., Berlin]

Nutrient-deficiency trials were conducted since 1937 in 2 fields (one continuously deficient, the other given nutrients from 1949–53) where cropping was alternately barley and potato. The behaviour of the weed population was studied during 1954–8. Botanical analyses of the weed flora were carried out 14 days before harvesting the barley, using Braun-Blanquet's scale of cover which was converted for this experiment into a scale of abundance. The weed associations of the various nutrient-deficiency plots is discussed. There were significant correlations between weed population and chemical properties of the soil.—D.B.

418 Wheeler, A. F. J. **Selective weed control in cereals with CMPP and sodium monochloroacetate.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4,** 39–43, bibl. 2. [Plant Protection Ltd, Fernhurst]

CMPP at 2·5 lb/ac was very effective against *Galium aparine*, but a rate of 2 lb/ac was unsatisfactory for control of over-wintered infestations in winter cereals. *Stellaria media* was eradicated by 2 lb CMPP/ac. Sodium monochloroacetate was generally disappointing against these weeds. The standard rate of 20 lb/ac reduced *Galium aparine* by 59% and *Stellaria media* by 63%, on an over-all average. *Polygonum persicaria* and *P. convolvulus* were very susceptible to Na monochloroacetate. Both herbicides caused a negligible incidence of malformity in wheat, oats, and barley sprayed early, and neither caused significant yield reductions. CMPP was more effective than MCPA/Na monochloroacetate mixtures in controlling mixed stands of *Galium aparine* and *Chenopodium album*. Spray applications of 1·5 lb MCPA + 20 lb Na monochloroacetate/ac did not significantly reduce cereal yields. F. s.—A.M.H.

419 Lush, G. B. and others. **Further work with CMPP in cereal crops.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 44–54, bibl. 3. [Boots Pure Drug Co. Ltd, Lenton Exp. Sta.]

For control of cleavers (*Galium aparine*) in cereal crops, CMPP at 2·4 lb a.e./ac gave consistently good results when weather was favourable. Control was adversely affected by low temperatures. Application of less than 20 gal of spray per ac is not generally recommended. For control of chickweed (*Stellaria media*), CMPP at 2 lb a.e./ac was satisfactory, while in warm weather 1·6 lb a.e./ac was adequate. The temperature requirements for good control of chickweed with CMPP were less exacting than for cleavers. The relative susceptibility of 46 other weed spp. is tabulated, with notes on the reaction of some of these. The tolerance of cereal varieties to CMPP is discussed. Results of variety and yield trials showed that none of the barley and oat varieties tested had outstanding susceptibility to CMPP. Spraying these at early growth stages is now recommended. The wheat varieties Atle and Atson were susceptible when sprayed at an early leaf stage (i.e. during the early differentiation of spikelet initials of " double ridges ") but Koga II could safely be sprayed from the 1- to 2-leaf stage up to the " jointing" stage.—A.M.H.

420 Syngrassides, A. I. **Weeds and weed-control in cereals.** *Countryman, Nicosia* 1960, Sept.—Oct., 6–9, illus. [Govern. Farm, Morphou, Cyprus]

The noxious weeds of Cyprus (listed) include wild oats (*Avena* spp.), wild mustard (*Sinapis* spp.), *Fumaria* spp., *Papaver rhoeas*, *Chrysanthemum* spp. and *Galium* spp. Results are given from a trial to determine the optimal quantity of 2,4-D (sodium salt) for controlling weeds in wheat crops. A table shows the susceptibility of 27 species of broad-leaved weeds to treatment with 2,4-D.—E.B.O.

421 Aspinall, D. **An analysis of competition between barley and white persicaria. 2. Factors determining the course of competition.** *Ann. appl. Biol.* 1960, **48**, No. 3, 637–54, bibl. 21. [Sch. Agric., Univ. Nottingham, Sutton Bonington]

White persicaria (*Polygonum lapathifolium*) grown with barley had a lower relative growth rate, a lower net-assimilation rate, a higher leaf-area ratio and a higher leaf-area : leaf-weight ratio than when grown alone. These differences were accentuated with time and with increase in the density of the surrounding barley plants. It was confirmed that the responses were those of plants subjected to a high degree of shading. An attempt was made to distinguish the effect of competition between shoots from competition between the roots. Root competition appeared to reduce growth more than did shoot competition although the influence of the latter increased with time. Increase in nutrient supply caused a proportionately greater increase in the growth of white persicaria than of barley in a mixed population. These results suggest that restricted nutrient supply was the factor which first decreased the growth of white persicaria. This was a direct consequence of its smaller root system arising from a smaller embryo than that of barley. The divergence between the amount of growth of the two species with time led to the white persicaria plants becoming progressively more and more shaded, and ultimately caused a further reduction in the rate of expansion of the root system and of the leaves. Although restriction in light was involved, it seemed likely that mineral nutrients were the factors always in shortest supply. The reduction in tiller number, but not in dry weight, of barley when grown with white persicaria was interpreted as a response to a lower internal concentration of nitrogen arising directly from the lower external concentration. Root extension did not appear to be significantly reduced. [See also *Fld Crop Abstr.* 12 : 1548.] F.s.—M.H.

422 Murant, A. F. **Control of wild oats (*Avena fatua*) in sugar beet, 1955-58.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 162–7, bibl. 6. [Norfolk Agric. Sta., Sprowston]

In a series of experiments in 1955–8 various herbicides were applied to the seed-bed and incorporated into the soil before drilling sugar-beet seed. Counts of wild oat and sugar-beet emergence were made just before singling. TCA at 6 lb/ac gave an average of 80% control of wild oats. Propham at 3 lb/ac gave an average of 60% control. Dalapon was slightly inferior to TCA. None of the other herbicides tested were superior to TCA or propham. The effect of time of application and the length of time between spraying and drilling is discussed.—A.M.H.

423 Butler, A. J. **Chemical control of wild oats by pre-sowing treatments.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 167–70, bibl. 2. [Plant Protection Ltd., Fernhurst]

Results are given of 6 trials on peas and sugar-beet carried out in Suffolk in 1958, using TCA, propham, CIPC and CDEC at various rates. Only TCA at 7·5 lb/ac and propham at 4 lb/ac were consistently satisfactory for both control of wild oats and minimal crop damage. TCA generally controlled wild oats rather better than did propham, while propham gave better control of broad-leaved weeds. Propham reduced the germination of beet by 20% in one trial, but had little effect in the other five. TCA did not affect germination but caused about 20% reduction in vigour of peas. Propham at 2 lb/ac and CDEC at 4 or 8 lb/ac gave unsatisfactory control of wild oats. CIPC at 2 or 4 lb/ac, and propham at 8 lb/ac, although giving excellent weed control, were too severe on the crops. F. s.—A.M.H.

424 Proctor, J. M. and Armsby, W. A. **Control of wild oats in peas : progress report, 1957-58.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 156–61, bibl. 6. [Pea Growing Res. Org., Yaxley, Peterborough]

In 6 experiments TCA, propham, CDAA and CDEC were compared when applied at 2 pre-drilling times, with and without heavy cultivation. TCA was more consistent than propham in controlling wild oats but, at the rates tested, invariably damaged growth of the pea crop. Its use is recommended where wild-oat populations are high enough for the risk of some crop damage to be acceptable. Otherwise, propham at not more than 3 lb/ac is recommended. CDAA and CDEC gave unsatisfactory results. F. s.—A.M.H.

425† Granström, B. TCA mot kvickrot. [**Control of couch grass** (*Agropyron repens*) **with TCA.**] *Medd. 105 Stat. JordbrFörsök, Uppsala* 1960, pp. 20, bibl. 22, English summary.

A summary is given of the results from about 70 field trials in different parts of Sweden. TCA persists longer in the soil in north Sweden than in the south, and longer in clay, humic soils than in sandy soils. In north Sweden it is preferable to treat the frozen soil in the autumn before the snow period, while treatment in Feb.–March is preferable in south-central Sweden. A rate of 20–25 kg TCA per ha controls couch grass satisfactorily. Information is given on the susceptibility of various crops to TCA. Dalapon at 25 kg per ha has a slightly stronger effect on couch grass than a same amount of TCA. F. Eng. s.—E.B.O.

426 Portères, R. Une céréale toxique de ramassage dans l'Ouest-Africain (*Paspalum scrobiculatum* var. *polystachyum*). [**A toxic wild cereal in West Africa** (***Paspalum scrobiculatum* var. *polystachyum***).] *J. Agric. trop. et Bot. appl.* 1959, **6**, No. 12, 680–4, bibl. 9, illus.

Information is given on several species of *Paspalum*, which are mainly weeds of crops in West Africa. *P. conjugatum* is a weed in plantations of young forest trees. *P. scrobiculatum* var. *commersonii* is a weed of rice crops, and its seeds are sometimes collected for human food. *P. scrobiculatum* var. *polystachyum* is also a weed of rice crops ; its seeds, which are difficult to separate from those of rice, are sometimes collected separately for human food ; they contain a toxic principle.—E.B.O.

427 Rincon, D. J. Control del corocillo o coquillo. [**Control of nutgrass** (***Cyperus rotundus***) **(in Venezuela).**] *Ingen. agron.* 1960, No. 4, 23–30, bibl. 41, illus.

The first part of this article reviews the literature and gives information on the characteristics of this weed, and on methods tested in other countries for controlling it ; the second part gives an account of herbicide trials in Venezuela. Of those tested, EPTC applied to the soil was the most effective and gave good control of nutgrass for 3 months, or longer, when applied at 7·5 kg/ha during the dry season. The effectiveness of EPTC is reduced where the soil-moisture content is high. Maize can safely be sown 4 weeks after treatment. —E.B.O.

428† Kramer, M. O contrôle da tiririca com produtos químicos. [**Chemical control of nutgrass** (***Cyperus rotundus***).] *Biológico, S. Paulo* 1959, **25**, No. 2, 39–44, bibl. 12, illus., English summary. [Inst. Biol., São Paulo, Brazil]

In plot trials to study the chemical control of nutgrass without soil cultivation, significant reduction of infestation was obtained but not complete eradication, and it was necessary to repeat the treatments. Of the herbicides tested, the most satisfactory were : bi-hedonal (2,4-D plus MCPA, amines) at 20 kg/ha ; ervoxone (2,4-D amine) at 10 kg plus TCA-90 at 40 kg ; ervoxone at 10 kg ; mata-ervas " C " (sodium chlorate, borax and 2,4-D) at 100 kg/ha. Dalapon at 25 kg/ha was moderately effective.—E.B.O.

429† Wiese, A. F. and Rea, H. E. **Bindweed** (***Convolvulus arvensis* L.**) **control and seedling emergence as affected by tillage, 2,4-D and competitive crops.** *Agron. J.* 1959, **51**, No. 11, 672–5, bibl. 30. [Texas Agric. Exp. Sta., S.W. Great Plains Field Sta., Bushland]

During 1949–56 in the semi-arid conditions of N.W. Texas (rainfall 18 in.), field bindweed on non-cropped land was successfully controlled in 5 yr by repeated sweep cultivation 10 and 15 days after weed emergence, or by repeated applications of 2,4-D ester or amine [rates not given]. Using

winter wheat as a competitive crop, control was obtained with several combinations of sweep cultivations and 2,4-D applications (0·5 or 1·0 lb/ac). Close-drilled forage sorghum was not a satisfactory competitive crop. Bindweed seedling emergence was reduced on plots which were repeatedly treated with 2,4-D. F. s.—A.M.H.

430 Director of the Highveld Region, Union of South Africa. **Witchweed control.** *Rep. Dir. Highveld Reg. S. Afr. 1956-7* 1959, 11.

In investigations to determine the efficacy of various crops, grown separately and in rotation, in controlling red witchweed (*Striga lutea*), maize was used as a test crop. Maize, following 4 yr of Radar kaffir corn [*Sorghum* spp.] yielded 26·6 bags/morgen [= 2·117 ac] compared with 2·1 bags from the control [no cleaning crop?]. On plots where Martin kaffir corn and babala [*Pennisetum typhoideum*] had been grown continuously for 4 yr, a following crop of maize yielded 13·9 and 13·4 bags/morgen respectively. The yields obtained in the rotational cropping systems were approx. 8 bags maize/morgen.—s.m.j.

431 Lhoste, J. and others. **Control of *Galium aparine* with MCPP in France.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 66–7, bibl. 1. [Procida, Neuilly-sur-Seine, France]

Complete control of *G. aparine* was obtained by treating with DNOC ammonium salt at 2·4 kg/ha, provided the plants were not older than the 2-leaf stage. Later treatment was possible with MCPP. The recommended rate was 2·56 kg/ha in 200, 400 or 1000 l water.—A.M.H.

432† Meadly, G. R. W. **Cape tulip.** *J. Dep. Agric. W. Aust.* 1960, **1**, No. 7, 593–9.

Cape tulip (*Homeria breyniana* and *H. miniata*), a weed poisonous to livestock, is described. It can be controlled by spraying infested areas with 2 lb a.e. of 2,4-D ester/ac, or 1 lb a.e./ac in sparsely infested areas.—s.m.j.

433 Slabber, M. H. **Weed control.** *Rep. Winter Rainfall Region, Dep. agric. tech. Serv. 1958/59* [n.d.], 11–12.

MCPP at 4 lb a.e./morgen eradicated *Rumex acetosella*. The aerial parts of *Alhagi camelorum* died within 6 weeks of spraying with 2,4,5-T amyl ester (rate of application not specified). A 0·5% solution of PCP applied at 300 gal/morgen eradicated *Salvinia auriculata* from standing water. 2,4-DB and 2,4-D (rates not specified) killed *Plantago lanceolata*. A solution of 2,4,5-T (amyl ester) in power paraffin or power paraffin alone killed *Hakea sericea* and *H. gibbosa* when applied to the lower 3 ft of the stems.—s.m.j.

434† Ministry of Agriculture, Fisheries and Food. England and Wales. **The control of rushes.** *Adv. Leafl. 433 Minist. Agric., Fish., Fd* 1960, pp. 5, London : HMSO.

The distribution and control of *Juncus effusus*, *J. conglomeratus*, *J. inflexus*, *J. articulatus*, *J. maritimus*, *J. acutiflorus*, *J. subnodulosus* and *J. squarrosus* are described.—s.m.j.

435† Overbeek, J. van. **New herbicide for aquatic weed control.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 259–61, bibl. 3. [Shell Development Co., USA]

F. 98 aquatic herbicide (essential ingredient acrolein) satisfactorily and economically controlled submerged weeds in irrigation canals, even up to 15–20 miles from the point of application. The treated water was not harmful to crops. F. s.—A.M.H.

436† Barnsley, G. E. and Yates, J. **An assessment of sodium diphenylborinate as a selective herbicide.** *Proc. Brit. Weed Contr. Conf. 1958* 1960, **4**, 245–50, bibl. 8. [Woodstock Agric. Res. Centre, Shell Research Ltd.]

Common seedling annual weeds were controlled by 1·5 – 5 lb/sodium diphenylborinate/ac applied as an aqueous solution. Susceptibility generally decreased with age. Cereals and certain varieties of peas were substantially unaffected by 6 lb/ac. Various grasses and clovers, linseed and pea varieties tolerated 2–4 lb/ac. F .s.—A.M.H.

437 Burnside, O. C. **The influence of environmental factors on the phytotoxicity and dissipation of simazin.** *Diss. Abstr.* 1960, **20**, No. 10, 3914. [Univ. Minnesota, St. Paul]

There was a wide margin of safety for the selective control of annual weeds in maize using simazin. Simazin applied at 2 and 4 lb/ac significantly increased dry-matter yields of maize and decreased those of weeds in a field experiment on silt loam soil. Among other field crops tested, Norghum sorghum tolerated simazin best, followed by Marine flax, Flambeau soyabeans, Caribou rye, Selkirk wheat, Kindred barley and Clintland oats. Increases in soil organic matter decreased the phytotoxicity of simazin. In the case of maize, phytotoxicity increased with increasing soil pH and soil temperature, but decreased under conditions conducive to increased transpiration.—r.b.

438† Voevodin, A. V. and Andreev, S. V. **[Absorption of 2,4-D by the leaves of wild plants.]** [Russian] *Doklady Akad. Nauk SSSR (Proc. Acad. Sci. USSR)* 1960, **134**, No. 1, 211–13. [All-Union Inst. Plant Protection]

The authors studied the absorption by leaves of

an 0·8% solution of 2,4-D (sodium salt) and its translocation within the plant by means of labelled C (0·016 mc/ml). There is evidence that while weed species differ in regard to the amount of 2,4-D they absorb, dicotyledons absorb the substance more actively than do grasses. Moistening the leaves with 15% OP-7 (a wetting agent), in addition to 2,4-D, increases absorption of the herbicide, and an addition of diesel oil (0·5–1%) improves the translocation of 2,4-D to the roots. High doses of 2,4-D [e.g. 1·5 kg/ha] impair such translocation, prevent destruction of weed roots and lower the herbicide's efficiency.—M.H.

439 STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR, DENMARK. Ukrudtsfrøs spireevne efter opbevaring i ensilage. [**The germinating capacity of weed seeds after storage in silage.**] *Medd. 633 Stat. Forsøgsvirk. Plantekult.* 1959, pp. 2.

During investigations in 1955–6 and 1957–8, 200 and 800 seeds, respectively, of each of 14 weeds (listed) were placed in a cloth bag in a wire container and buried in silos, containing beet tops or sugar-beet residues, at a depth of 1 m for about 2 months before being sown in boxes. Germination counts were made periodically for 18 months. In 11 species germination was nil or 1%. *Chenopodium album* had a 15 and 43% germination following ensilage in sugar-beet tops and residues, repectively. Corresponding figures for *Matricaria inodora* were 8 and 2%, and for *Solanum nigrum*, 15 and 23%.—S.M.J.

SURVEYS AND LAND USE

SURVEYS

440 AHN, P. M. **The principal areas of remaining original forest in Western Ghana, and their potential value for agricultural purposes.** *J. W. Afr. Sci. Ass.* 1959, **5**, No. 2, 91–100, bibl. 8, 3 maps. [Ghana Div. Agric.]

Conclusions drawn from this survey of forest areas of western Ghana and their rate of clearing, indicate that the clearing and development of the wetter areas on poorer soils in S.W. Ghana depend on increased interest in the rice-growing (and other crop) potentialities of the areas.—S.M.J.

441† ZWIJSEN, R. Synthèse des problèmes d'établissement du paysannat en Chefferie Alur Pandoro. [**The problems of establishing peasants in the Alur Pandoro district (Congo).**] *Bull. agric. Congo belge* 1960, **51**, No. 3, 683–738, bibl. 7, illus., Flemish summary. [Sta. Rech. Agron. INÉAC, Nioka, Congo]

Information is given on climate, vegetation and agriculture in that district.—E.B.O.

442 WINBERG, I. P. Naturliga jordbruksområden i Sverige, för statistiskt bruk. **Natural farming areas in Sweden, for statistical use.** *K. Skogs. LantbrAkad. Tidskr.* 1959, **98**, No. 5, 352–90, bibl. 23, 2 maps, English summary. [Kungl. Lantbruksstyrelsen, Stockholm]

443 OEEC. **Agricultural regions in the European Economic Community.** *Doc. Ser. 27 OEEC/EPA* 1960, pp. 53, 5 maps.

This survey of agricultural regions in Europe consists of 3 main chapters : method of enquiry ; application of method and general results ; situation and characteristics of the major agricultural regions of the E.E.C. A table gives the principal climatic features of these regions. A map shows the percentage areas under forage crops and cereals, and the yields of wheat.—E.B.O.

LAND USE

444† LARA NIETO, D. J. La colonización en Israel. [**Colonization in Israel.**] *Publ. Inst. nac. Coloniz. Minist. Agric. Spain* 1960, pp. 28, map.

Information is given on the development of agriculture, land use and agricultural colonization in Israel.—E.B.O.

445† GWYNNE, M. D. **Drought effects on plants.** *New Scient.* 1960, **8**, No. 201, 795–7, illus. [Bot. Sch., Oxford]

In this short review the author points out that the study of drought resistance in plants may contribute to the utilization of the arid regions of the world for food production.—A.G.G.H.

446† CRUTTENDEN, L. H. **The ecology and land use of Gwanda I.C.A. [S. Rhodesia].** *Rhod. agric. J.* 1960, **57**, No. 2, 124–33, bibl. 5. [Dep. Conserv. and Ext., S. Rhodesia]

The Gwanda Intensive Conservation Area comprises some 800,000 ac in S. Matabeleland between the Tuli and Umzingwane rivers. The topography, climate and land use of the area are described.—S.M.J.

447† PONCET, J. Regards sur l'agriculture soviétique. [**Notes on Soviet agriculture.**] *Ann. Géogr.* 1960, **69**, No. 373, 251–66, illus.

Information is given on agriculture in southern Ukraine.—E.B.O.

FARMING SYSTEMS AND PRACTICES

See also Abs. 75, 156, 261.

448 Vicary, J. R. **Agricultural year at Yabob village [New Guinea].** *Papua agric. J.* 1960, **12**, No. 4, 180–91, illus.

Information is given on shifting agriculture practised near Madang, where the crops grown include taro (*Colocasia* spp.), maize, yam (*Dioscorea* spp.), groundnuts and sweet-potatoes.—E.B.O.

449† Lucenko, M. N. **[The farming systems in White Russia.]** [Russian] *Vestn. S-H. Nauki* (*J. agric. Sci. USSR*) 1960, **5**, No. 8, 23–34.

The territory of White Russia comprises 207·6 thousand sq. km. At the beginning of 1960, 9·7 million ha were agricultural areas, of which 6·0 million ha were arable, 2·4 million hay meadows and 1·2 million pasture. The country is one of the most marshy regions in the European SSR, the marshes occupying approx. 7 million ha. Details are supplied of the cropping systems and yields obtained in the different State and collective farms. —M.H.

450 Joy, J. L. and Lea, J. D. **Some economic aspects of mechanized farming at Namulonge, Uganda.** *Emp. J. exp. Agric.* 1960, **28**, No. 111, 223–4, bibl. 4. [Makerere Coll. and Cotton Res. Sta., Namulonge]

451 Auckland, A. K. **Soya beans in a mechanized farming system in Tanganyika.** *Trop. Agric., Trin.* 1960, **37**, No. 3, 201–9, bibl. 6, illus. [Minist. Nat. Resources, Tanganyika]

A history of the fluctuations of crop production in a system of mechanized farming at Nachingwea in S. Tanganyika is outlined. The place of groundnuts as the most important crop in the area has now been taken by soyabeans. The agricultural and economic reasons for their importance are explained. F. s.—S.M.J.

452 Driver, C. M. **Principles of crop rotation.** *Proc. N.Z. Inst. Agric. Sci.* 1959, 75–85, bibl. 7. [Crop Res. Div., DSIR] [Received Sept. 1960]

453 Fraigneaud, R. Application des programmes linéaires à la détermination des assolements. **[Application of linear programmes to the determination of crop rotations.]** *C.R. Acad. Agric. Fr.* 1960, **46**, No. 12, 676–83, bibl. 7.

A method is presented and discussed. [See also *Fld Crop Abstr.* 13 : 1997.]—E.B.O.

454† Lewis, A. H. and others. **A comparison of ley and arable farming systems.** *J. agric. Sci.* 1960, **54**, Pt 3, 310–17, bibl. 11. [ICI Ltd., Jealott's Hill Res. Sta., Bracknell, Berks]

During the period 1945–56 the following systems were compared, using marrow-stemmed kale and wheat as test crops : (a) 3-yr ley ; (b) wheat/2-yr ley ; (c) wheat/barley/1-yr ley ; (d) wheat/barley/barley. The effect on crop yields of compost, dung and N fertilizer dressings applied to kale was also studied. The respective increments of kale (ton/ac) and wheat (cwt/ac) above treatment (d) were as follows from the 1-, 2- and 3-yr leys, respectively : 5·2 and 8·7, 9 and 13·5, 9·2 and 15. There was no difference between the application of dung or compost to kale on the yields of a succeeding wheat crop. The average response to organic fertilizer was 1·6 cwt grain/ac and this was unaffected by rotation. The residual value of dung on subsequent crops of winter wheat was 2 cwt grain/ac/yr (average value). The response of kale to an additional 0·4 cwt N/ac was greatest after continuous arable cropping and virtually nil after a 3-yr ley. The addition of 0·4 cwt additional N/ac to kale in the previous year improved the average yields of wheat grain by 1 cwt/ac.—S.M.J.

455† Hood, A. E. M. **An experiment on the effect of leys on soil fertility.** *Proc. 8th internat. Grassl. Congr. 1960* 1960, pp. 3, bibl. 4, French and German summaries. [ICI Ltd., Jealott's Hill Res. Sta., Bracknell, Berks]

The effects on crop production and on soil properties of ley/arable farming systems containing 1-, 2- and 3-yr grazed leys were compared with those of continuous arable cropping. The leys, especially those of 2- and 3-yrs' duration, produced larger yields and better soil condition than the all-arable rotation. Crops in the continuous arable system were poorer for several reasons, including the breakdown of soil aggregates, more weed growth, higher incidence of 'take-all' disease of wheat and depletion of N reserves in the soil. It was concluded that in order to obtain the maximum effect of leys on fertility the land should be in grass for at least as long as it is under arable cultivation. F. s.—R.B.

456† Williams, T. E. and others. **Soil nitrogen status of leys and subsequent wheat yields.** *Proc. 8th internat. Grassl. Congr. 1960* 1960, pp. 5, bibl. 16, French and German summaries. [Grassland Res. Inst., Hurley, Berks]

Leys of 3 or 4 years' duration which varied in botanical composition, method of utilization and in the amount of nitrogenous fertilizer they re-

ceived, were followed by winter wheat. The use of nitrogenous fertilizers on grazed grass/clover leys increased, and on cut leys decreased, the yield of the following wheat crop. Yield of grain varied widely, being increased by increasing proportions of legume in the sward. Grazing or cutting regimes influenced the proportion of legume in mixed swards and this in turn interacted with the influence of the return of stock excreta. The N status of the soils after leys was assessed by the amount of mineral N present in soil samples after incubation. A high correlation was found between N status so determined and the yield of wheat. In the experiments discussed virtually all of the variation in wheat yield and variation in response to nitrogenous fertilizer was accounted for by variation in soil N status, suggesting that changes under the leys in other edaphic factors were of little importance for wheat yields. The assessment of the soil N status after leys by the incubation technique described, and the use of statistical methods to isolate its effect on subsequent crop yields, may be valuable where changes in soil structure under leys are suspected also of influencing subsequent crop yields. F. s.—R.B.

457† Steinbrenner, K. Einfluss einer Kleegras- und Futterrübenvorfrucht auf eine Reihe messbarer Bodeneigenschaften und den Ertrag von Hafer. [**Effect of clover/grass and fodder-beet as preceding crops on several measurable soil characters and on the yield of oats.**] *Albr.-Thaer-Arch.* 1959, **3**, No. 2, 130–8, English and Russian summaries. [Inst. Acker- u. PflBau Müncheberg (Mark) E. Germany]

Oats (Flämingsgold) were grown after (a) 2-yr clover/grass ley and (b) 2-yr root crops (potatoes followed by fodder-beet). Tillering and density of stand of oats were significantly better after the ley than after the root crops, but germination, number of grains per panicle and 1000-grain weight were not appreciably influenced by the preceding crop. Grain yield, but not straw yield, was significantly better after the ley. The physical and chemical properties of the soil after clover/grass were superior to those after the root crops, and this superiority would account for the higher grain yields after clover/grass.—D.B.

458† Fol'mer, N. [**Agronomic evaluation of herbage and arable crop rotations according to yields of spring wheat and oats in the forest/steppe of the Trans-Urals.**] [Russian] *Sel'hoz. Sibiri* (*Agric., Siberia*) 1960, **5**, No. 2, 13–18. [Troick Exp. Field, Čeljabinsk Province]

459† Kuksin, N. V. **Ley rotations on lowland grasslands of the Poles'e in the Ukrainian SSR.** *Proc. 8th internat. Grassl. Congr. 1960* 1960, pp. 3, French and German summaries. [Ukrainian Res. Inst. Agric., Kiev, USSR]

Since 1950, experiments to study ley rotations have been carried out on the lowland grasslands of the Poles'e, Ukrainian SSR. By the introduction of ley rotations, the productivity of the land has increased by 40–80% compared with long-term sown meadow and by 400–500% compared with natural unimproved grasslands. The ley rotation with 3–4 yr of annual crops and 3–4 yr of perennial grasses is the most productive. During the cropping period of the ley rotation the organic matter and structure of the soil show definite signs of deterioration and by the 6th yr after ploughing the sward the yield of annual crops is considerably reduced. The organic matter and structure of the soil improved during the herbage period of the rotation and by the 3rd and 4th yr conditions were similar to those of soil under natural grassland. F. s. —R.B.

460† Belousov, M. A. and Ismailov, F. I. [**The effect on soil fertility of sowing lucerne and maize together.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1960, **10**, No. 5, 21–5.

In Uzbekistan the inclusion of maize in the cotton/lucerne rotation increases the yield of the herbage break, but as maize is exacting in its nutrient requirements, the question of the extent to which N, P and K are depleted from the soil by this crop is important. Tests were therefore made on the merits of the following sowings (each in 4 replications on old arable soil after 6 years of cotton production) : (1) *Medicago sativa* alone ; (2) lucerne with oats ; (3) maize sown in spring for silage and again in Aug., together with lucerne, for green feed ; (4) herbage mixture (lucerne + *Lolium perenne* + *Dactylis glomerata*) together with maize ; (5) lucerne + maize, sown in spring. It is claimed that (5) is preferable to (4), but (3) gives the highest yield of fodder units and has the best effect on soil fertility in a cotton/lucerne rotation.—M.H.

461† Batalin, M. Działanie nawozow zielonych w plonach głownych. Cz. 2. Wpływ pastewnego łubinu żółtego i jego resztek pożniwnych na plony rzepaku ozimego i pszenicy ozimej na glebach piaskowych. **The effect of green manure as main crops. 2. The influence of yellow fodder lupin and its stubble on winter rape and wheat on sandy soils.** *Roczn. Nauk rol.* 1959, **80**, Ser. A, No. 2, 261–80, bibl. 14, English summary.

Trials in 1952–5 showed that on a well cultivated sandy soil it is possible, even without the addition of f.y.m., to obtain satisfactory yields of winter rape (1950 kg/ha) if it is sown after yellow fodder lupin [*Lupinus luteus*] with the addition of commercial fertilizers. A similar yield (2080 kg/ha) was obtained after full green lupin manuring, which indicates the advantage of harvesting the

green lupins as fodder, and replacing them as manure by cheaper mineral fertilizers. Similar results were obtained in the experiment with winter wheat, which gave an average yield of 1370 kg/ha after full green manuring and of 1340 kg/ha after lupin stubble + commercial N. Low yields of winter wheat were due principally to frosts in 1954, and the wheat was especially heavily damaged after full green manuring. F. Eng. s.—G.M.R.

462† Suškevič, A. P. [**Possibilities of utilizing shabdar, *Trifolium resupinatum*, in the Hunger Steppe.**] [Russian] *Hlopkovodstvo* (*Cott. Prod.*) 1960, **10**, No. 3, 15–19.

In the soils of the Hunger Steppe [approx. 70°E., 46°N.] where infiltration of salt is prevalent, a herbage course in a crop rotation is important. Under conditions in Soviet Central Asia, the organic residues in the soil after a herbage sward quickly disappear and the main problem is their replenishment. The use of green manure as advocated by Malickiĭ [*Fld Crop Abstr.* 12 : 1908] involves a 10-course rotation in which shabdar provides the green manure for cotton. Shabdar (a megathermic plant) is a new crop in the Hunger Steppe where the 10-year average mid-day temperatures in February and March are 4·2°C and 8·3°C, respectively ; on 2 occasions in the 10 years, mid-day temperature was below zero. Furthermore, in the autumn (when shabdar is sown) the seasonal accumulation of salt in the upper soil layers of the Hunger Steppe is at its maximum. In tests at the Central Experimental Station of the All-Union Sci. Res. Institute for Cotton Production, the shabdar variety B-3 was sown (3 Sept. 1958) on plots of 1·2 ha (3 replications) under conditions typical for the Hunger Steppe. The data show that the crop is not sufficiently salt-resistant and is of value only if the 0–60 cm soil horizon contains not more than 0·015–0·025% of chlorine ions. It is concluded that in the Hunger Steppe since shabdar does not produce adequate green yield by the end of April, it should be sown as the first course in a cotton rotation so that after harvesting as hay, the residue can be ploughed in before a sowing of maize for silage. An experiment with 2 replications showed that the stems of maize (sown in autumn) grew to 80 cm the following August compared with 230 cm on soil containing shabdar green manure. After the maize harvest at the beginning of Sept., a lucerne/ryegrass mixture or winter barley should be sown. This greatly enhances the yield of fodder per unit area in a cotton/herbage rotation.—M.H.

463 Agricultural Experiment Station, Salisbury. **Stubble mulching and trash farming.** *Rep. agric. Exp. Sta., Salisbury 1958–9* [Cont. in] *Rhod. agric. J.* 1960, **57**, No. 3, 232.

Methods for using maize stover and other crop residues are being investigated. During 1954–8 maize was grown as a test crop, and in 1958–9 soyabeans were grown. The treatments were : (a) maize stalks cut to ground level and removed, (b) stalks ploughed back, (c) stalks chopped and left on the surface, (d) stalks removed and 2 tons kraal compost/ac ploughed back. Both maize and soyabeans gave higher yields under (b) (7·8 and 23·4 bags, respectively) than under (a) (6·7 and 22 bags). (1 bag = 200 lb.) Under treatment (c) yields of soyabeans equalled those under (b) but maize yields were reduced. It is thought that the lower yields of maize in (c) may be due to the mulch affecting soil temperature. The beneficial effect of ploughing back the stover was cumulative, but it also apparently increased the incidence of *Diplodia* spp.—S.M.J.

464 Van Gilst, K. B. Sunnhennep (*Crotalaria juncea*) as wisselbougewas vir tuinbougronde. **Sunnhemp (*Crotalaria juncea*) as a rotation crop in horticulture.** *S. Afr. J. agric. Sci.* 1960, **3**, No. 2, 209–29, bibl. 3, French and English summaries. [Dep. Hort., Pretoria]

The effect was investigated, of incorporating sunnhemp as a green manure in March, April or May, at flowering, pod formation and harvest on these following crops : rye, sweet-corn and cabbage. After incorporation in March, decomposition took place rapidly and large amounts of nitrate N were available within a few weeks. Significant increases in yields of rye were obtained when sunnhemp was ploughed in at the flowering stage in April.—S.M.J.

465† Lantmannen Svenskt Land. Nu kan man sprida vatten och handelsgödsel samtidigt. [**Simultaneous application of water and commercial fertilizers now possible.**] *Lantm. Svenskt Land* 1960, **71**, No. 20, 469, illus.

A short description is given of an attachment to irrigation equipment which is made by a West German firm. The attachment has a 50-kg-capacity container for water-soluble fertilizers, which are distributed in the irrigation water.—G.M.R.

466 Brouwer, W. Beregnung nach dem Entwicklungszustand der Pflanzen. [**The time of irrigation as determined by the growing stage of the crops.**] *Rep. Conf. Supplem. Irrig., Commiss. 6. internat. Soc. Soil Sci., Copenhagen 1958* Wageningen, 1959, 93–8, English summary. [Inst. Pflanzenbau u. PflZücht., Stuttgart-Hohenheim, W. Germany]

With winter grain crops irrigation during tillering was beneficial only after frost damage. When irrigation was applied during stem elongation, rye and oats responded only in very dry years. Irrigation at the flowering stage gave the best

results. Spring-barley, -oats and -wheat responded to irrigation applied 2–4 weeks after emergence if the temperature was >13°C. The best time for irrigation of maize was from flowering to ear formation. Irrigation of leguminous crops during flowering increased the number of pods and the size and number of seeds. Irrigation of potatoes before flowering was effective only in dry years. irrigation of sugar-beet was most effective in July and August. F. Eng. s.—S.M.J.

467† MURCIA, D. A. Aguas y riegos en Israel. [**Water and irrigation in Israel.**] *Publ. Inst. nac. Coloniz. Minist. Agric. Spain* 1960, pp. 21, map.

This publication includes information on climate and irrigated crops in Israel, where 70% of the irrigation water is applied by sprinkling.—E.B.O.

468† HALLGREN, G. **Loss of water by sprinkling irrigation.** *Rep. Conf. Supplem. Irrig., Commiss., 6 internat. Soc. Soil Sci., Copenhagen 1958* Wageningen, 1959, 115–19, German summary. [Inst. Hydrotek., Kungl. LantbrHøgsk., Uppsala, Sweden]

During 1955–6 sprinkler irrigation experiments were carried out on a sandy soil at Ultuna, Uppsala. Evaporation losses were much greater when irrigation was applied by day than by night. Irregularities in uneven water distribution may be obviated by allowing a 50–60% overlap by the sprinklers. Preliminary experiments indicated that the loss of water by evaporation was diminished if several sprinklers were used at the same time, in combination. F. s.—S.M.J.

469† VALENZUELA, J. L. El efecto de las quemas sobre el suelo. [**The effect of burning on soil.**] *Suelo tico* 1959, **11**, No. 41, 1–22, bibl. 38, illus.

This is a review of information from the USA, Colombia, Brazil, Rhodesia, Kenya and Malaya. It is concluded that more studies should be carried out on burning the vegetation, which appears to have both harmful and beneficial effects on the soil.—E.B.O.

SOIL AND WATER CONSERVATION

See also Abs. 137, 262.

470† TEJWANI, K. G. **Soil and water conservation in the ravine lands of Gujarat.** *J. Soil and Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 79–84, illus. [Soil Conserv. Res. Demonstration and Training Centre, Vasad]

471† SHENG, T. C. **Present soil conservation program in Taiwan.** *J. Soil Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 69–73 and 78. [Joint Commission on Rural Reconstruction, Taipei, Taiwan, Free-China]

472 HORNER, G. M. **Effect of cropping systems on runoff, erosion and wheat yields.** *Agron. J.* 1960, **52**, No. 6, 342-4, bibl. 6. [Washington Agric. Exp. Sta., Pullman]

The effects of the following crop rotations were studied : (a) lucerne/*Bromus*/*Agropyron desertorum* for 4 years, cut for hay, followed by winter wheat, winter wheat, peas, and winter wheat ; (b) sweet clover [*Melilotus* sp.]/mountain brome grass [*Bromus marginatus*] for 2 yr as green manure, winter wheat, peas, and winter wheat ; (c) Hubam sweet clover [*Melilotus alba* var. *annua*] for green manure, followed by winter wheat ; (d) peas for green manure, followed by winter wheat ; (e) peas for seed, followed by winter wheat, (f) summer fallow, followed by winter wheat. Land sown or prepared for sowing to winter wheat was more susceptible to erosion than land supporting a stand of vegetation. Treatment (a) was most effective for controlling erosion, followed by (b), (c), (d), (e) and (f). Five times more erosion occurred on treatment (f) than on treatment (a). Soil N was increased to the greatest extent by rotations including legumes for hay or green manure, and decreased to the greatest extent by fallowing. Wheat yields were about 50% greater in treatments (a) and (b) than in treatments (d), (e) and (f).—R.B.

473 BERTONI, J. O espaçamento dos terraços em culturas anuais, determinado em função das perdas por erosão. [**Terrace spacing with annual crops, based on soil losses through erosion.**] *Bragantia* 1959, **18**, No. 10, 113–40, bibl. 19, English summary. [Inst. Agron. São Paulo, Brazil]

474† PRAKASH, M. **Importance of 'shelter-belts' to check wind-erosion.** *J. Soil Wat. Conserv. India* 1959, **7**, Nos. 4 and 5, 61–6, bibl. 7. [Ootacamund, Madras]

This paper is a review of experience with shelter belts and gives examples from India, China, Canada, USA, Steppes of Russia and European countries.—D.B.

AGRO-METEOROLOGY AND CLIMATOLOGY

475† Air Ministry Meteorological Office, Great Britain. **Averages of earth temperature for the British Isles.** *M.O. 665.* 1960, pp. 159, London : HMSO, 10s. [Received July 1960]

476† De Fina, A. L. and Sabella, L. J. Cálculo de las temperaturas medias de localidades montañosas carentes de observaciones termométricas. [**Calculation of mean temperatures of mountain localities lacking thermometrical observations.**] *Publ. 66 Sec. Agric. Ganad. Argentina* 1960, 127–45, bibl. 2, English summary.

A method is proposed for calculating rapidly the mean air temperatures (of a month or a year) of mountain localities lacking thermometric observations, provided their altitudes are known and data from a few meteorological observatories are available. The method is based on the calculation of the average vertical gradient of temperature for the mountain area under study. In the example given, calculations were made for 19 localities at altitudes ranging from 287 to 4600 m alt. in the provinces of Jujuy and Salta.—E.B.O.

477† Frolow, V. La composante annuelle des pluies et des températures dans le pays entre la Volga et l'Oural. [**The annual component of rainfall and temperature in the region between the Volga and Ural rivers.**] *Ann. Géogr.* 1960, **69,** No. 372, 113–23, bibl. 2, illus.

This component is expressed by a formula, which is given.—E.B.O.

478† Paterson, S. S. Förslag till bioklimatisk region-indelning av Norden. **A scheme for the bioclimatic regional classification of Scandinavia.** *Svensk geogr. Årsb.* 1959, **35,** 102–22, bibl. 58, English summary.

An account is given of a scheme for the bioclimatic classification of Scandinavia into 23 regions on the basis of mean monthly temperature combinations and seasonal distribution of rainfall. —P.J.B.

479† Voets, B. A. D. Weerkundig overzicht over het jaar 1959. **Meteorological records of Surinam 1959.** *Surinaam. Landb.* 1959, **7,** Nos. 5–6, 151–63. [LandbProefst. Suriname, Paramaribo]

Maps of rainfall distribution in Surinam, and tables of rainfall, sunshine, average temperature, maximum and minimum temperature and relative humidity at various locations are given for each month of the year 1959. Rainfall figures at 6 locations, and data of temperature, sunshine, relative humidity, cloud cover and wind speed at the Agricultural Experiment Station at Paramaribo are compared with long-term average data. A comparison between 10-day rainfall at Paramaribo during 1959 and long-term 10-day average rainfall is given in histogram form.—R.B.

480† De Fina, A. L. and Sabella, L. J. La predicción de las areas de lluvia por el nuevo método casi objectivo RDF. [**The forecast of areas of rain by the new, almost objective, RDF method.**] *Rev. Invest. agríc., B. Aires* 1958, **12,** No. 3, 247–97, bibl. 9, maps, English, French and German summaries. [Univ. Nac. La Plata, Argentina] [Received Aug., 1960]

In this method dichotomic keys are applied to air-pressure data (reduced to sea level) obtained from a baric circuit which is ultrasensitive to weather changes. In Argentina, where this circuit covers 8 stations, the forecast of areas of rain during the next 48 hr is done in about 40 min, using a file-archive of punched cards. F. S.—E.B.O.

481 Skurlow, J. **A nomogram for the estimation of rainfall intensities and run-off.** *J. Soil Conserv. N.S.W. 1960* 1960, **16,** No. 2, pp. 112–26, bibl. 3, illus.

482 Panabokke, C. R. **Water consumption pattern of crops in the dry zone environment [of Ceylon].** *Trop. Agriculturist* 1959, **115,** No. 3, 187–94, bibl. 6. [Dep. Agric., Ceylon]

Information is given on the climate in the dry zone of Ceylon where a field experiment was carried out to measure the water consumption of crops and the evapotranspiration in different periods of the year. The crops included maize, sorghum, groundnuts, cotton and *Eleusine* sp. The results are discussed.—E.B.O.

483† Janert, H. Die potentielle Evapotranspiration als Grundlage für Berechnungen des Wasserhaushaltes bewässerter Böden. [**The evapotranspiration potential as the basis for calculating the water balance of irrigated soils.**] *Z. Acker- u. PflBau* 1960, **110,** No. 2, 163–72, bibl. 5, English summary. [Inst. Angewandte Bodenkunde und Bodenmeliorationen, Greifswald-Eldena, E. Germany]

On the basis of the results of several years of lysimeter experiments in Eberswalde, and of the summarised results of W. Freckmann's (1930) experiments on irrigation, a formula has been developed for calculating the potential evapo-

transpiration, which incorporates a soil factor as well as one dependent on the crops. F. Eng. s.—D.B.

484† Rijtema, P. E. **Calculation methods of potential evapotranspiration.** *Rep. Conf. Supplem. Irrig., Commiss. 6 internat. Soc. Soil Sci., Copenhagen, 1958* Wageningen, 1959, 15–24, bibl. 17, French and German summaries. [Inst. Land and Water Mgmt Res., Wageningen]

Values of potential evapotranspiration, calculated from the formulae of Penman, Makkink, Turc and Haude, were compared over 10-day periods with values measured from a pan and from lysimeters covered with grass. Calculated values for relative sunshine were used with Penman's formula. There was a good agreement between actual evaporation from the pan and calculated evaporation. Haude and Uhlig give coefficients with which Haude's formula must be multiplied to obtain values of the potential evapotranspiration. These coefficients did not give correct results at Wageningen. A new reduction factor was calculated, consisting of a day-length factor and a wind-velocity factor. It was possible to calculate the potential evapotranspiration with the formulae of Penman, Makkink and Turc with the same degree of accuracy as was obtainable with lysimeters or evaporation pans. Haude's formula gave results that appeared to be somewhat less accurate. F. s.—S.M.J.

485† Stol, P. T. **A statistical analysis of the differences between precipitation and evaporation in the Netherlands.** *Rep. Conf. Supplem. Irrig., Commiss. 6 internat. Soc. Soil Sci., Copenhagen, 1958* Wageningen 1959, 41–9, French and German summaries. [Inst. Land and Water Mgmt Res., Wageningen]

486† Aslyng, H. C. **Climatic aspects of supplemental irrigation.** *Rep. Conf. Supplem. Irrig., Commiss. 6 internat. Soc. Soil Sci., Copenhagen, 1958* Wageningen, 1959, 3–14, bibl. 19, illus. [Roy. Vet. Agric. Coll., Copenhagen]

A screened evaporimeter, 1 m deep, with a rim 8 cm high, its water surface level with the ground and the screen of wire netting suspended midway between rim and water surface, is recommended for obtaining information on potential evapotranspiration for experimental and practical supplementary surface irrigation. F. s.—S.M.J.

487† Black, J. N. **The relationship between illumination and global radiation.** *Trans. roy. Soc. S. Aust.* 1960, **83**, 83–7, bibl. 26. [Waite Agric. Res. Inst., Univ. Adelaide]

An examination was made of the relationship between illumination and global radiation at Helsinki, Stockholm, Kew, Vienna and Jerusalem, where long-term records of both factors are available, to determine whether in studies of agronomy and plant ecology radiation data can be used as an index of the light climate. Despite differences in instrumentation and climate, a high correlation was found between illumination and radiation and there was no significant departure of the data for any of the stations from the common regression. It is concluded that, at least for the climates of which the 5 stations are representative, radiation can be used as an index of the light climate. F. s.—E.B.O.

488† Newman, J. E. and Wang, J.-Y. **Defining agricultural seasons in the middle latitudes.** *Agron. J.* 1959, **51**, No. 10, 579–82, bibl. 10. [Purdue Univ. Agric. Exp. Sta., Lafayette, Indiana]

On the basis of data from 12 localities in Wisconsin, the year is divided into 6 agricultural seasons according to crop responses and the % frequency of selected daily maximum and minimum temperatures. Minimum temperatures were found to reflect the microclimatic conditions of a locality. Maximum temperatures were more influenced by daily weather patterns and reflected the macroclimate of the region. The application of this classification to different parts of the USA is discussed.—A.M.H.

489 De Fina, A. L. and others. Difusión geográfica de cultivos índices en las provincias de Jujuy y Salta y sus causas. [**Geographical distribution of [climatic] indicator crops in the provinces of Jujuy and Salta and its causes.**] *Publ. 67 Sec. Agric. Ganad. Argentina* 1960, pp. 35, maps, English summary.

[See also *Fld Crop Abstr.* 13 : 953.]

490† Trapnell, C. G. and Griffiths, J. F. **The rainfall-altitude relation and its ecological significance in Kenya.** *E. Afr. agric. J.* 1960, **25**, No. 4, 207–13, bibl. 8.

The vegetation types of southern Kenya have been found to fall into 3 separable climatic series in the range between higher and moister and lower and drier conditions. The lines of division between these sequences have been drawn on a small-scale map. Their effect is to show that southern Kenya is divisible into 3 main sectors, referred to as the Western Decline, the Rift Highlands, and the Eastern Decline. This 3-fold division is found to be associated with differing combinations of rainfall and altitude, expressed in terms of the number of in. of rainfall/1000 ft of altitude. Computations for 550 stations show that the Eastern and Western Declines enjoy high rainfall/altitude ratios, falling generally between 6 and 16 in./1000 feet, whereas the greater part of the Rift Highlands sector has only 3 or 6 in./1000 ft. Exceptions in the Baringo-

Elgeyo rift region are commented on. The lines of division otherwise correspond remarkably closely to the 6 in. isogram. This relationship may be regarded as a first approximation to one of rainfall and temperature. Its significance is discussed with reference to temperature/altitude relations and to its general bearing on bioclimatic interpretation in Kenya. F. s.—s.m.j.

491 Johnson, W. C. **A mathematical procedure for evaluating relationships between climate and wheat yields.** *Agron. J.* 1959, **51,** No. 11, 635–9, bibl. 9. [Soil Survey Investigations, U.S. Dep. Agric., Lincoln, Nebraska]

A method is presented for deriving a crop/weather, yield-estimating equation, in which the mean and variance of the estimated yields are the same as those of the observed yields and the sum of squares of errors is minimized. Use of the equation is suggested for estimating a frequency distribution of wheat yields from climatic data, with special reference to the part of the Southern High Plains west of the 100th meridian and south of the Nebraska " panhandle." F. s.—a.m.h.

492 Baumann, H. Die Beziehungen zwischen Witterungsverlauf und Ernteertrag bei Winterweizen und Winterroggen im Dikopshofer Dauerdüngungsversuch 1906–1957. Ein ökologischer Vergleich. [**Relationships between the sequence of weather conditions and yields of winter wheat and winter rye in the long-term manurial trials 1908–57 in Dikopshof. An ecological comparison.**] *Z. Acker- u. PflBau* 1960, **110,** No. 4, 345–63, bibl. 20, English summary.

Grain yields of winter wheat and winter rye from the farmyard-manured half of the long-term complete fertilizer plots at Dikopshof (in the Kölner Bucht) were adjusted to eliminate the effects of other factors and were correlated with meteorological data which were already available. The correlations reveal that winter rye is sensitive to autumn weather. It requires a long, mild autumn with rainfall below normal and a gradual transition in temperature to wintry conditions. A late spring with low temperature in February (1·4°C) helps to produce good yields. The remaining critical period is the first 5-day period of flowering when the best temperature is 13–15°C. Winter wheat is sensitive to fluctuations above and below the optimum May and June temperatures which are 12·6 and 16·1°C, respectively. Autumn is not a critical period, but it is noted that a dry autumn, continuously mild weather through winter and spring, moderate rainfall in March, and many dry days from mid-April to mid-May provide good conditions for wheat yield. Rye required a continental- and wheat a maritime-climate.—d.b.

493 Hanke, P. Zur Ermittlung phänologischer Daten bei Mais. [**The determination of phenological data for maize.**] *Albr.-Thaer-Arch.* 1959, **3,** No. 2, 139–45, bibl. 22, English and Russian summaries.

In E. Germany, the best growth stages for making observations in climate and growth studies on maize are : (1) the beginning of the vegetative period, (2) cob formation and (3) ripening. F. Ger. s.—d.b.

494 Vasil'ev, M. [**Forest shelterbelts and maize yield.**] [Russian] *Sel'hoz. Sibiri (Agric. Siberia)* 1960, **5,** No. 2, 26–8.

495† Garber, K. Neuere Literatur über Rauch-, Staub- und Abgasschäden. Eine übersicht, zusammengestellt. [**Recent literature on damage from smoke, dust and exhaust gases. A review.**] *Angew. Bot.* 1960, **34,** No. 2, 65–103, bibl. 331. [Staatsinst. f. Angew. Bot., Hamburg, W. Germany]

This review on the effect of air pollution on plants and animals is written from the standpoint of the causes of the pollution rather than the vegetation. The reader is directed to items in the bibliography which deal with the effect of the following impurities on plants and animals : sulphurous and sulphuric acids, fluorine, chlorine, sulphuretted hydrogen, mercury vapour, ammonia, organic gases, smog, cement dust, coal dust and radioactive impurities.—d.b.

496† Gorham, E. and Gordon, A. G. **Some effects of smelter pollution northeast of Falconbridge, Ontario.** *Canad. J. Bot.* 1960, **38,** No. 3, 307–12, bibl. 6. [Bot. Dep., Univ. Toronto]

The number of species present in the flora declines sharply within 4 miles of the smelter, but certain spp. disappear at much greater distances. The most tolerant spp. are listed. F. s.—a.g.g.h.

497 Gorham, E. and Gordon, A. G. **The influence of smelter fumes upon the chemical composition of lake waters near Sudbury, Ontario, and upon the surrounding vegetation.** *Canad. J. Bot.* 1960, **38,** No. 4, 477–87, bibl. 11, illus.

MISCELLANEOUS

498† FAO. **The Agriculture Division of FAO. A summary of its organization, development and accomplishments from 2 December 1946 to 31 December 1958.** *Inf. work. Pap. FAO* 1959, pp. 301.

499† FAO. **The state of food and agriculture 1960.** Rome, 1960, pp. 182, bibl. in text.

500† OEEC. **Agriculture and food. Summary report on activities undertaken by EPA [European Productivity Agency] since its establishment in 1953.** 1960, pp. 61.

501† Institut National pour l'Étude Agronomique du Congo Belge (INÉAC). Son but, son programme, ses réalisations. [**The object, the programme and achievements of INÉAC.**] 5th edn, 1959, pp. 168, illus.

502† Fournier d'Albe, E. M. **Arid zone research in Mexico.** *Arid Zone UNESCO* 1960, No. 8, 11–16. [Inst. Appl. Sci., Mexico]

503 Whitrow, Magda. [Ed.] **Index to theses accepted for higher degrees in the Universities of Great Britain and Ireland. Vol. 8. 1957–58.** 1960, pp. xii + 173, 24 × 15 cm, London : Aslib, 25s.

The theses recorded include the following : Responses of cereals at varying ages to factors controlling flowering and metabolic changes in the embryo during vernalization, by O. R. Jewiss ; The growth of the cotton crop and the control of the red bollworm, *Diparopsis perditor*, in the Gash Delta, by E. B. Dennis ; Immediate effects of maleic hydrazide and other growth substances on growth rate of maize coleoptiles, by M. E. C. Croke ; The genecology of weed species. Studies on *Euphorbia cyparissias* L. and *Hypericum perforatum* L. by T. O. Pritchard ; A study in the management of graminaeous plants : the effect of pretreatment on future growth, by S. K. Majumdar; Studies on *Solanum tuberosum* L. with special reference to storage and factors affecting success in the field, by T. M. W. Davidson.—s.m.j.

504† Proceedings of the International Seed Testing Association. **International rules for seed testing.** *Proc. internat. Seed Test. Ass.* 1959, **24**, No. 3, 475–584.

These rules were adopted by the meeting of the International Seed Testing Association in Dublin on 29 May, 1953, and revised at the Paris meeting on 8 June, 1956, and the Oslo meeting on 10 July, 1959. The present rules became effective in the Northern Hemisphere on 1 July, 1960, and will become effective in the Southern Hemisphere on 1 January, 1961. All earlier International Rules for Seed Testing are cancelled. The rules have been translated into German (by Dr. F. Keding) and published in the *Proc. internat. Seed Test. Ass.* 1960, Vol. 25, No. 3, 873–993.—m.h.

505† International Seed Testing Association. **Proceedings of the 12th International Seed Testing Convention.** *Proc. internat. Seed Test. Ass.* 1960, **25**, No. 1, pp. 783.

This issue contains the preprints of papers delivered to this Convention in Oslo, 6–11 July, 1959. The following are selected titles from the 90 papers read : Comparative value of normal and questionable seedlings of peanuts and soyabeans by greenhouse tests, by A. M. Andersen ; Seedling colour as a means of determining the genuineness of varieties and strains with beets, by H. C. Baekgaard ; The topographical tetrazolium method for determining germinating capacity of *Lupinus luteus*, by J. F. Cabral and M. R. Cruz ; On the distinction of sugar beets, sugar-fodder beets (*Beta vulgaris*) and mangold in the laboratory, by H. Eifrig and S. K. Kamra ; Methodology of the vigour test for wheat, rye and barley in rolled filter paper, by H. Germ ; Effects of gibberellin on the germination of agricultural seeds, by J. Ichihara and others ; A chemical method for the determination of wild oats, by B. Nilsson ; Marsh spot and hollow heart in peas, by M. Noble ; A short contribution to the biometric study of the seeds of certain strains of rice cultivated in Portugal, by F. I. R. da Silva ; The water content and germination capacity of wheat under different storage conditions, by E. Frey.—m.h.

506† Nilsson-Leissner, G. and others. **Swedish seed production.** *Särtryck och småskr. 109* [revised] *K. LantbrHögsk. Stat. LantbrFörsök* 1959, pp. 66.

507 North Coombes, G. A. and d'Emmerez de Charmoy, A. **The production of food crops in Mauritius.** *Rev. agric. suc. Maurice* 1960, **39**, No. 3, 131–41.

508† Ministry of Economic Development, Lagos. **Index of research in agriculture, animal husbandry, animal disease and forestry, 1959–60.** *Minist. econ. Devel., Lagos, [Nigeria]* [n.d.], pp. 48, [Received Oct. 1960]

This is a summary of research projects undertaken by the Federal Ministry of Research and Information, the Ministries of Agriculture, Animal Health and Natural Resources in the Northern, Western, and Eastern Regions of Nigeria and the Southern Cameroons, and by the University College, Ibadan, Nigeria.—S.M.J.

509 PERRIN DE BRICHAMBAUT, G. **The introduction and exchange of plant material between countries of the inter-tropical zone.** *Pl. Introd. Newsletter* 1960, No. 7, 1–6, text in English and French. [Crop Prod. and Improv. Br., FAO]

510 STRICKLAND, A. H. **Pest and disease losses in agriculture.** *New Scient.* 1960, **8,** No. 199, 660–2, illus. [Pl. Pathol. Lab., Harpenden, Herts]

Little is known about pest and disease losses on a world basis. Figures are given, founded on well-based estimates, which show the pest and disease losses of some important food crops in different countries. If the human population continues to increase at its present rate a greatly increased effort to control pests and diseases throughout the world is needed now, an effort based on an understanding of the crop in its environment and a rational use of chemicals.—A.G.G.H.

511† PETERS, R. A. and HALL, R. J. **The toxicity to rabbits and some other animals of the fluorofatty acid present in the seeds of *Dichapetalum toxicarium*.** *J. Sci. Fd Agric.* 1960, **11,** No. 10, 608–12, bibl. 8. [ARC, Inst. Anim. Physiol., Babraham, Cambridge]

It is suggested that ground *Dichapetalum toxicarium* seed mixed with oats might be a better rabbit poison than sodium fluoroacetate as it is less toxic to sheep.—S.M.J.

512 HESELTINE, N. **The quelea bird, a problem of international control.** *World Crops* 1960, **12,** No. 6, 209–12.

Past and present attempts to control *Quelea quelea* are reviewed.—S.M.J.

513 CHERRINGTON, J. **Second thoughts on America.** *Fmr and Stk-Breed.* 1960, **74,** 3695, 87 and 89.

A short account of current farming problems in the USA.—A.G.G.H.

REPORTS

514† **FAO.** Report of the FAO/CCTA technical meeting on legumes in agriculture and human nutrition in Africa, held in Bukavu, Belgian Congo, 10-15, November, 1958. *Meet. Rep. 1958/22 FAO* 1959, pp. 68, bibl. 92. [Received July, 1960]

See Abstract 249.

515† **Great Britain.** Agricultural Research Council. Report for the year 1958–9. London : HMSO, 1960, pp. vii + 213.

This report includes the following anonymous review articles, with bibliographies : The assessment of crop losses caused by diseases and pests ; Controlled environment facilities for plant research.—S.M.J.

516† **Great Britain.** Report of the Welsh Plant Breeding Station for 1959. Aberystwyth 1960, pp. 119, illus.

The first annual report, for 1959, of the Welsh Plant Breeding Station, has recently been published by the University of Wales. Hitherto the results of work at this Station were published in scientific journals, bulletins and leaflets. Three reports have already been published, covering the periods 1919–33, 1950–56 and 1956–58. In the new annual report emphasis has been given to research problems which are nearing completion or where significant developments are expected in the near future.—S.M.J.

See Abstracts 58, 59.

517 **Netherlands.** Peulvruchten Studie Combinatie. Meerjarenplan voor onderzoek akkerbouwpeulvruchten. Verslag over het eerste jaar 1958. [Pulse Crop Study Group. Long-term plan for research work on arable pulse crops. Report on the first year 1958.] [n.d.], pp. 38, illus.

518† **Denmark.** Report of the Conference on Supplemental Irrigation, Commission 6, International Society of Soil Science, held in Copenhagen 1958. *Publ. Inst. Land and Water Mgmt Res.* Wageningen, Netherlands, 1959, pp. 148, illus., 4 maps. [Received Sept. 1960]

See Abstracts 33, 466, 468, 484, 485, 486.

519† **Spain.** Estación Experimental de Aula Dei. Departamento de mejora. Ensayos 1958–1959. [Improvement Department. Trials in 1958–9.] Zaragoza, [n.d.], pp. 16.

See Abstracts 16, 61, 83.

520† **Union of South Africa.** A year in the Highveld region 1956–57. Annual report of the Director of the Highveld region, 1st July, 1956–30th June, 1957. Pretoria, 1959, pp. 51. [Received August, 1960]
See Abstracts 108, 217, 225. 226.

521† **Union of South Africa.** Annual Report of the Winter Rainfall Region (1958/59). Department of Agricultural Technical Services. [n.d.], pp. 80. [Received June 1960]
See Abstract 433.

522† **Federation of Rhodesia and Nyasaland.** Secretary to the Federal Ministry of Agriculture. Report for the year ended 30th September, 1959. Salisbury, 1960, pp. 212, 3 maps.
See Abstracts 97, 314, 323, 349.

523 **Federation of Rhodesia and Nyasaland.** Report of the Agricultural Experiment Station, Salisbury. Results of experiments for the season 1958–1959. [Cont. in] *Rhod. Agric. J.* **57**, No. 3, 231–43.
See Abstract 463.

524 **Tanganyika Territory, Eastern Province.** Empire Cotton Growing Corporation. Progress Reports from Experiment Stations. Season 1958–9. London, 1960, pp. 15. [Received August 1960]
See Abstract 335.

525 **Basutoland.** Department of Agriculture. Annual report for the year 1959. Maseru [n.d.], pp. 98, illus. [Received June 1960]
See Abstract 49.

526 **Australia.** Eleventh Annual Report of the Commonwealth Scientific and Industrial Research Organization for the year 1958–59. Canberra 1959, pp. 181. 10s. 6d. [Received July 1960]

527† **New South Wales.** Report of the Department of Agriculture for the year ended 30th June, 1959. Sydney, 1959, pp. 144.
See Abstract 173.

528 **British Guiana.** Annual Report of the Director of Agriculture for the year 1959. British Guiana [n.d.], pp. 76. [Received July 1960]
See Abstracts 117, 169, 174, 175, 179, 244.

529 **Surinam.** Landbouwproefstation, Suriname. Jaarverslag 1959. [Agricultural Experiment Station, Surinam. Annual Report for 1959.] Paramaribo, 1960, pp. 116, illus.
See Abstracts 156, 158, 159, 194, 200, 224, 229, 245.

BOOKS

530† Jacks, G. V. and others. [Eds] **Multilingual vocabulary of soil science.** 2nd revised edn, 1960, pp. xxiv + 430, 28 × 20 cm, Rome : FAO, 22s. 6d. or $4·50.

In this vocabulary of soil terms in 9 languages (English, French, Spanish, German, Portuguese, Italian, Dutch, Swedish and Russian) the terms are grouped according to subject. The subject heads include : biology, ecology, cultivation, manuring, fertility, climate, drainage and irrigation.—E.B.O.

531† Commonwealth Bureau of Soils. **Bibliography of soil science, fertilizers and general agronomy.** 1960, pp. xxv + 762, 22 × 14 cm, Farnham Royal : Commonwealth Agricultural Bureaux, £4.

In this volume, the ninth of the series, the 1956–1959 world production of some 14,000 scientific papers on soil science, soil-plant relationships and the fertilizing of all crop plants is referenced and classified by a Decimal Classification (D.C.). The enquirer into any particular subject can here obtain, at one opening, bibliographical details of every paper published on that subject in 1956–1959. In addition, most entries indicate where abstracts of the paper in question can be found in the abstract journal *Soils and Fertilizers*. With the help of the detailed subject index provided, he can trace papers which, although primarily concerned with other matters, contain significant information on the subject of his interest. Also included are a key to the D.C. numbers used, an explanation of the use of the D.C., an author index, and a list of the 1,800 periodicals in which the papers originally appeared. F. s.—S.M.J.

532 Teuscher, H. and Adler, R. **The soil and its fertility.** 1960, pp. vii + 446, 23·5 × 15·5 cm, New York : Reinhold Publ. Corp., Chapman and Hall, London, £5.

The aim of the authors, as stated in the preface, is a very laudable one : to describe the soil in relation to the plants which it produces and to explain what renders a soil fertile. It is scarcely a new approach to soil science as they seem to consider ; nevertheless it could provide a valuable contribution to the literature available on this

subject if the matter were up-to-date, the principal factors in crop production clearly defined and these examined in detail. Unfortunately, this book is rather an elementary tome, touching on much in a very superficial manner, leaving many topics after a perfunctory introduction and certainly not arguing closely the relationships between soil characteristics and crop production. Within the 432 pages of text the authors have seen fit to include paragraphs on subjects such as the dangers of exhaust gases from internal combustion engines, and 'why ice floats partly above the water,' but they have not mentioned, in a paragraph dealing with the exchange of gases between soil and air, the significance of gaseous diffusion. Likewise some brief account of the concept of moisture tension should surely be included in a discussion on soil water (Chapter 7).

Although in general the factual matter would seem to be reasonably reliable, and is certainly presented in a lively and interesting manner, there are statements which do not accord fully with experimental evidence. It is stated, for example, that hoof and horn meal is of negligible value as a source of nitrogen and that probably its main virtue lies in the carbon dioxide evolved during the decomposition of this material !

The publishers claim that 'The soil and its fertility' will be of immense practical value to farmers, horticulturists and agronomists. If such readers should consult the glossary provided they will find that a nodule is 'a small knot'.—C. R. Clement.

533 VERDEYEN, J. Pour mieux comprendre et mieux raisonner la fumure des prairies pâturées en particulier et des plantes de grande culture en général. [**Towards a better understanding and reasoning about the manuring of grazed meadows in particular, and of field crops in general.**] Vol. 2, [n.d.], pp. 320, 26 × 17·5 cm, Bruxelles: Cent. Nat. Rech. Herb. Fourrag. [Received Aug., 1960]

[See also *Fld Crop Abstr.* 13 : 1030.]

534† STEWARD, F. C. **Plant Physiology. A treatise. Vol. 1B. Photosynthesis and chemosynthesis.** 1960, pp. 365, bibl. 710, 23 × 15 cm, New York and London : Academic Press, 86s.

The chapters in Vol. 1 B deal with the acquisition of energy by plants and its storage in ultimately usable chemical forms. The first chapter is on energy storage by photosynthesis ; the second, on chemosynthesis, deals with the energy relations of chemoautotrophic organisms. This volume follows the one noted in *Fld Crop Abstr.* 13 : 2060 and precedes Vol. 2 (published earlier), abstracted in *Fld Crop Abstr.* 13 : 1551.—D.B.

535† PAPADAKIS, J. Geografía agrícola mundial. [**World agricultural geography.**] 1960, pp. 650, bibl. 228, maps, 22 × 15 cm, Barcelona : Salvat Editores, S.A.

In this volume, which incorporates and considerably amplifies two previous publications of the author (see *Fld Crop Abstr.* 10 : 353 and 354), a very large amount of climatic data and information on world soil distribution is assembled, coded, and correlated with the ecological requirements of the different crop and herbage plants. The outcome is a compendium of information which should be of untold usefulness to agricultural planners in particular, and also to university students and others. A necessary condition for its usefulness, however, would appear to be a complete grasp of the author's own system of classification of climates and soils. The most important characteristics of climate from an ecological point of view are : winter cold, summer heat, and the ratio between available moisture and the moisture required by plants during the different periods of the year (see pp. 84–6 for the author's method of calculating the humidity index). Climodiagrams for any given locality are drawn up by presenting in one diagram the graphs of : average temperature, minimal temperature and humidity index, each plotted against the months of the year. The first 3 chapters of the book treat the influence of climate and soil upon plants and the influence of plants upon one another ; chapters 4 and 5 the ecological classification of (a) crops and (b) climates ; chapter 6 the intensity and rhythm of plant growth; and chapter 7 the geography of vegetation (dynamics and types). In chapters 8 and 9, soils are dealt with, their formation and distribution ; and chapter 10 (an interesting section) discusses the evolution and problems of agriculture in the different parts of the world. Chapter 11 distinguishes 12 great groups of climates with their particular agricultural aptitudes ; and most of the remainder of the work (chapters 12 – 26) treats in detailed fashion the agricultural geography of the world. The final chapter, 27, is concerned with the geography of animal husbandry, as governed by plant availability, and with horticulture and forestry. A vast amount of information is contained in the 5 world maps and the tables of ecological data for localities representative of the different agricultural regions. Binding, printing, and general presentation are excellent.—G.M.R.

536† TAYLOR, B. W. Estudios ecológicos para el aprovechamiento de la tierra en Nicaragua. **Ecological land use surveys in Nicaragua.** Vol. 1, 1959, pp. 338, map, text in Spanish and English, 25 × 19 cm, FAO.

This book consists of 3 separate reports, each of a land survey of a different region of Nicaragua, viz. the Puerto Cabezas—Río Coco area [for this area see *Fld Crop Abstr.* 13 : 957], the Matagalpa –

Esteli – Ocotal area and the Boaco-Santo Tomás area. The principle adopted was to give a comprehensive account of all the environmental factors which affect land use ; this has entailed a study of climate, soils and vegetation. The object of these studies was to describe the land, and thus provide a sound basis for the development of agriculture, pastures and forestry.—E.B.O.

537† Kotov, M. I. [Ed.] [**Flora of the Ukraine, Vol. 9.**] [Ukrainian] 1960, pp. 691, illus., 17 × 25 cm, Kiev : Acad. Sci. Uk. RSR, 39 roubles, 60 kopeks,

See also *Fld Crop Abstr.* 11 : 1859.

538 Murai, Mary and others. **Some tropical South Pacific Island foods. Description, history, use, composition, and nutritive value.** 1958, pp. 159, bibl. 77, illus., Honolulu : Univ. Hawaii Press.

This study was carried out on plants collected mainly in the Marshall and Caroline Islands, also in American Samoa, the Gilbert Islands and Hawaii. Information is given on the following root crops : *Colocasia esculenta, Cyrtosperma chamissonis, Alocasia macrorrhiza, Tacca leontopetaloides* and *Ipomoea batatas.*—E.B.O.

539† Ady, Peter. [Ed.] **Inventory of economic studies concerning Africa South of the Sahara. An annotated reading list of books, articles and official publications.** [English and French] *Publ. 30 CCTA/CSA* 1960, pp. xi + 302, London : CCTA/CSA.

Numerous references to agricultural studies are included.—A.G.G.H.

NEWS AND NOTES

International

540† World Land Use Survey. Professor L. Dudley Stamp has described the preparation and development of the World Land Use Survey which was inaugurated in 1949 and for whose pioneer work he was responsible. In 1956 he became its Chairman. Experimental mapping was carried out in Nyasaland, Kenya, Antigua and Mauritius to test the feasibility of using air photography for the survey. When this trial was successfully completed the method was extended to other parts of the world. Some World Land Use Survey Monographs have since been published including *Hong Kong* by T. R. Tregear and *The history of the evolution of the land use pattern in Cyprus* by D. Christodoulou. One of the difficulties encountered was the choice of a suitable means of classification of land use and potential output. Professor Stamp suggested the use of a Standard Nutrition Unit (SNU) of 1,000,000 K calories of farm production per annum to measure the output of areas of land. *Adv. Sci.* 1960, **17**, No. 66.—S.M.J.

541† Agro-climatological Studies in the Mediterranean Region. A Study Group, convened to examine the possibilities of establishing an FAO/UNESCO/WMO [World Meteorological Organization] joint project on agro-climatology in arid zones, held its first meeting in Rome in April, 1960. The Study Group agreed that such an inter-agency project was highly desirable, and that it should be called Study Project on Agro-climatology in the Arid and Semi-arid Parts of the Mediterranean region, that it should run for 18 months and should be concerned with a restricted number of plant species. It was decided that work should concentrate on : climate, crops (barley, wheat, seed legumes and fodder legumes among dry farming crops; and wheat, cotton and lucerne among irrigated crops), natural vegetation (determination of the growth period of the main perennial grasses), diseases, pests and soils. *Arid Zone UNESCO* No. 8, June, 1960.—E.B.O.

Great Britain

542 Visit to Ghana and Nigeria. The Assistant Director of the Commonwealth Bureau of Pastures and Field Crops, Mr. C. L. Skidmore, paid a visit to Ghana and the Federation of Nigeria from 7 Oct. to 2 Nov., 1960. His itinerary in Ghana was arranged by Mr. O. V. Snow, Chief Scientific Officer of the Division of Agriculture, and that in Nigeria by Dr. J. M. Waterston, Director of Federal Agricultural Research.

543 Weed Research Organization. On 1 April, 1960, the Agricultural Research Council of Gt Britain inaugurated a new Weed Research Organization. At present, this Organization has its headquarters at the Department of Agriculture of the University of Oxford, but will eventually be transferred to a new research station now being established at Begbroke Hill, about 5 miles outside Oxford. The activities of the Organization will be devoted mainly to applied research on weed control in agricultural and horticultural crops and will maintain close liaison with the fundamental research on growth-regulating substances now being carried out by the Unit of Experimental Agronomy at Oxford. The publication of *Weed Abstracts* will be continued.—P.J.B.

544 Colour Index of Potatoes. A new photo-electric device measures the browning that occurs on the cut surface of raw potatoes when they are exposed to air. Known as the potato reflectometer, it was devised primarily as a research tool in collaboration with the Low Temperature Research Station, Cambridge, where the mechanism of the browning reaction, and methods for controlling it, are being

studied. The extent of browning depends not only on variety, but is also influenced by the season and the locality in which the crop was grown ; it is at present quite unpredictable.—From *The New Scientist* 8 Sept. 1960.—A.G.G.H.

France

545† Edible African Legumes. *Canavalia ensiformis, C. gladiata, Lens esculenta* [= *L. culinaris*], *Piliostigma thonningii* and *Sphenostylis schweinfurthii* are illustrated in *Riz et Rizicult.* 1960, Vol. 6, No. 2–3, with notes on popular names and botanical characteristics. [See also *Herb. Abstr.* 30 : 1385.] —E.B.O.

German Federal Republic

546 Making Deserts Fertile. A German engineer, H. Baumann, has proposed using plastic foam to aid in the cultivation of sand deserts. A layer of foam on a sandy soil should act as a water reservoir. By depositing fertilizers, trace elements and soil bacteria in the foam, it is possible, Baumann believes, to create conditions where plants can grow and, once they provide a little shade, moisture will not evaporate so quickly from the soil. In time the layer of plastic foam will, of course, be destroyed by the roots of the plants, but meanwhile a layer of humus is supposed to have been built up, which should bear plant growth on its own if erosion is prevented.—From *The New Scientist* 8 Sept. 1960. —A.G.G.H.

USSR

547† Arid Zones. *Bulletin Technique d'Information* 1960, No. 151, 371–463, is devoted entirely to a report of a French mission which studied the improvement of arid zones in the USSR.—E.B.O.

Asia

548 Jute. World production of jute showed virtually no change until the season 1958–9, when it increased by some 14% over the total for the previous three seasons. Pakistan, which has a virtual monopoly of high-quality jute, contributed about 5% of this increase by yielding a crop of 1·1 million tons. India, with a crop of 900,000 tons of jute and 250,000 tons of " mesta " (25% more than in the previous season) achieved self-sufficiency in the lower grades of fibre. Expanding production of both jute and " kenaf " (the latter being, like " mesta," a jute-like fibre) in Burma, Thailand, China, Formosa, etc., brought the world total up to an estimated 2·6 million tons. *New Commonwealth* 1960, Vol. 38, No. 9, 590.—C.L.S.

India

549 Rice Storage. The rhizomes of *Acorus calamus*, growing in the state of Orissa and probably in other parts of India, are dried, ground, and the powder is mixed with rice paddy before it is stored. The entomologists at the Central Rice Research Institute at Cuttack maintain that the powder has insecticidal properties and is a good grain protectant. The powder is used at a rate of 1 lb per 100 lb paddy, and is, apparently, non-toxic to man. *Grain Storage Newsletter* 1960, No. 2.—E.B.O.

Pakistan

550 Dual sugar harvest. The experimental introduction of a winter crop of sugar-beet in N.W. Pakistan is proving a highly successful method for prolonging the sugar working season and stepping up sugar production. The sugar-beet crop, sown between Sept. and Nov., is ready for harvesting from the beginning of May, just when the processing season for sugar-cane comes to an end. There is the added advantage that the land can be used to produce a second crop, such as maize, before the next crop of sugar-beet is sown, whereas a cane crop takes 12–16 months to grow. Until local farmers gain experience with this new crop, the yields obtained may be only about two-thirds those to be expected under good conditions. This would still result in an output of 2·15 tons of sugar per acre from sugar-beet, as compared with 1·3 tons from sugar cane — which in that region has an average sugar yield of barely 8%. Winter sugar-beet production is no novelty. It is practised in Mediterranean countries where the winters are mild, e.g., S. Italy, and most sugar-beet breeders are developing varieties suitable for such climates. The variety used in the Pakistan trials was of German origin. *New Scient.* 1960, 8, No. 196, 458.—C.L.S.

Japan

551 Rice Storage. During the past decade investigations have been conducted on low-temperature storage of hulled and polished rice. This process is now in commercial use. In 1958, 15 warehouses, with a total of 14,000 m^2 floor space, had refrigeration facilities. Rice is stored at 15°C or below and at a relative humidity of 70–80%. Some of the advantages of low-temperature storage are : hulled rice is not damaged by micro-organisms and pests, and retains the appearance and quality of freshly harvested rice; viability of rice seed remains almost unchanged ; there is only a slight decrease in thiamine content. *Grain Storage Newsletter* Jan. 1960, No. 1.—E.B.O.

USA

552† National Seed Storage Laboratory, Fort Collins, Colorado. The object of this Laboratory is the storage of valuable seed for the use of research workers, and the carrying out of research on physiological problems on seed viability and longevity. The Laboratory is provided with refrigeration/dehumidification equipment and seed-cleaning equipment. In the storage rooms there is independent control of temperature (20°–40°F), while the relative humidity can be brought down to 35%. One small room has a controlled temperature range of 0–35°F at the same humidity level. Low temperature and high humidity are used for germinating hard seeds by the stratification technique. Assuming that the average sample of seed stored was 1 pint, about 250,000 such samples could be held in the laboratory. *Pl. Introd. Newsletter FAO* 1960, No. 7.—E.B.O.